MANORAMA

No. 61

TELL ME WHY



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Amazing Amphibians

Amphibians are an amazing lot, because their life is spent half on land, half in water!

Of course, the word 'amphibian' may first bring to mind the image of the bulging eyes of a frog. But the amphibian family has many other members too. Three main groups of amphibians exist on Earth today. Frogs and toads, which have no tails as adults, salamanders and newts, which have tails, and caecilians which have tails, but no legs.

Most of the members of this class typically begin their life in water as larvae, and more or less lead their adult lives on land. The first amphibians developed as fish out of water, and they are the link between vertebrates that live in water, and those that live on land.

Some scientists study amphibians to learn about the kinds that exist, and how they live. Other scientists study certain abilities of amphibians that may prove useful to man.

This issue of Tell me Why takes you to the wonder world of amphibians.

FROM THE HOUSE OF MAGIC POT, MANORAMA YEAR BOOK, VANITHA, THE WEEK AND THE MALAYALA MANORAMA DAILY

THE WORLD OF AMPHIBIANS

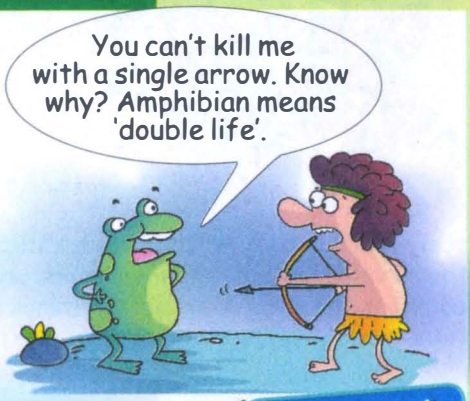


What are amphibians?

The word amphibian means double life- and amphibians are animals that are called by this name, because they need both land and water during their life cycle. They start life in the water, and wind up on land as adults. Amphibians are vertebrates, which means that they have a backbone, and they are also cold blooded. Do you know what a cold blooded animal is? It is an animal that cannot regulate its own body heat. So, an amphibian depends on its surroundings for warmth, and its body temperature varies according to the surroundings.

Another interesting feature of amphibians is that they have

no hair, feathers, or surface scales. They can breathe through their skin, though some amphibians have lungs as well. Frogs and toads are some of the most common amphibians, which means that all of us have seen an amphibian at some time or the other.

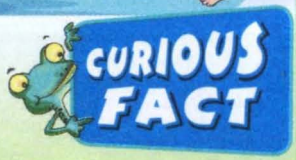


How are amphibians classified?

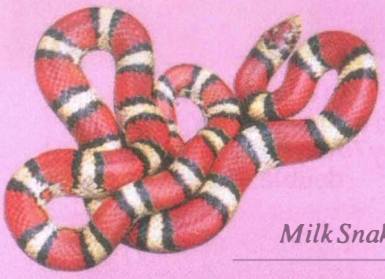
Amphibians can be classified into three main orders, each having its own species. The first order is Anura. Anura means 'absence of tails'. Frogs and toads belong to this order, which is also known as Salientia.

The second order is the Gymnophiona, which is also called as Apoda. A little known species that belongs to this order are Caecilians. About 50 species of amphibians belong to this order. They are aquatic in nature, and are found in Africa, South Asia, and America.

The third order is Caudata, which is also called as Urodela. The species that belong to this order are salamanders and newts. About 500 species belong to this order. The term Caudata means 'tail'. The species in this category have tails and four limbs.



The name amphibian comes from the Greek word 'amphibios', which means 'living a double life'. Amphibians start out as eggs that are usually laid and hatched in water, or on moist ground. The early stages of most amphibians' lives are spent in the water. As they mature, they go through major changes, called metamorphosis. Adult amphibians usually live on land, returning to it when it's time to breed.



Milk Snake

Not Amphibians

Lizards and snakes may look like amphibians but are not – they are reptiles. You can tell that they are not amphibians because their skins are dry and scaly. The eggs of reptiles have a thick, hard shell that protects the developing embryo from moisture loss, even on dry land. In contrast, the eggs of amphibians lack a hard outer covering and, thus, must be laid in water or in damp places.

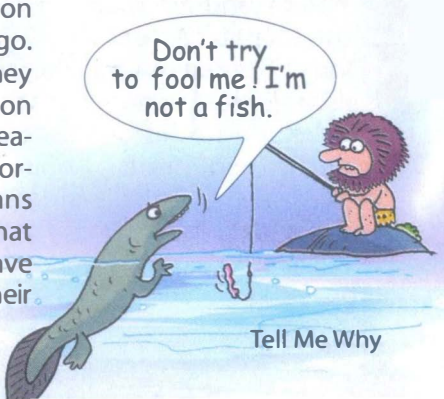


Ancestor of Modern Amphibians

What do we know about the origin of amphibians?

Amphibians first appeared on Earth around 360 million years ago. For tens of millions of years, they were the dominant land animals on Earth. Some of these ancient creatures were very big, and they terrorized smaller animals. Amphibians evolved from fishes that had fins that looked like legs. These fish may have crawled on to the land to escape their enemies, and also because they were attracted by the good supply of food on land.

Gradually, these first amphibians developed lungs for breathing, and their fins developed into limbs for crawling. Over hundreds of millions of years, many different amphibians evolved and disappeared, leaving the familiar salamanders and frogs of today.





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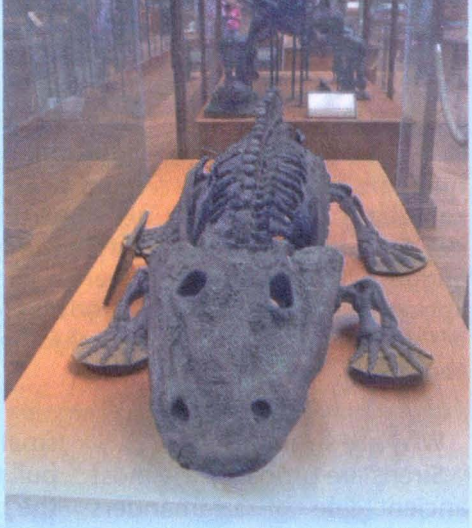
Ancient Frogs

The Discoglossus is probably the most ancient of frog species. Twenty million year old fossils of this frog have been found in Germany.

The modern living frogs of this species are very similar to their ancient ancestors, showing that they have changed very little in the 150 million years of their evolution.



Discoglossus



Skeleton of a Temnospondyl

Why is the early history of amphibians fascinating?

Amphibians evolved from fish about 400 million years ago, when the amount of dry land on Earth increased greatly. Certain fish adapted to these changing conditions by developing limbs to crawl with, and lungs to breathe. They came to be called 'amphibians,' and were the first animals with backbones to live on land. The largest variety of amphibians lived around 360 million to 230 million years ago, when the climate was constantly alternating between wet and dry.

The first amphibians were Temnospondyls. They were long-headed amphibians with a sprawling gait and distinctive look. The early Temnospondyls were the size of large fish. They had stubby feet, and probably couldn't

STAR FACT

Relatives From Abroad

Eight million year-old fossils of salamanders found in Switzerland bear a close resemblance to the hellbender which is a salamander found in the United States today. This suggests that hellbenders were a widely spread species, and that the land masses of Europe and America were once joined together.



Why are sirens special?

Sirens are probably the most ancient line of salamanders now alive on planet Earth. They are large eel like creatures that can reach 40 centimetres in length and are 2.5 centimetres in diameter. They have a pair of small front legs that they use to pull themselves along through the muddy murky world of the swamps that they live in. They have no hind legs.

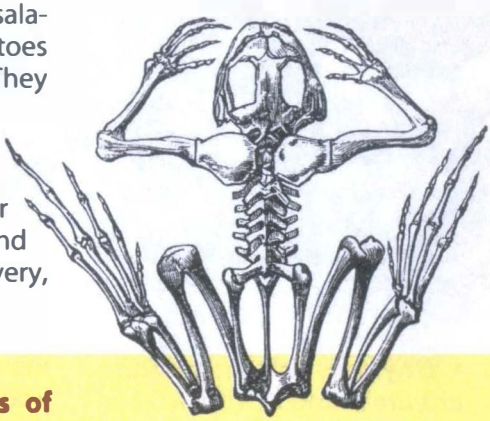
Sirens are special, because they can breathe through their lungs and skin, and also through



Siren

move very fast. Temnospondyls grew in size and diversity until some even grew as large as crocodiles. This animal, Prionosuchus is the largest amphibian known. Lissamphibians, the group that includes all modern amphibians and their common ancestors, emerged about 300 million years ago.

feathery gills. Unlike other salamanders, each of their four toes ends in a claw or toenail. They also have small horny beaks in their mouths instead of teeth- and their teeth are located in their throats! They don't bite, and aren't poisonous- and are very, very shy indeed!



Skeleton of Frog - An Illustration

Why are the skeletons of amphibians interesting?

Amphibian's skeletons are made of bones. They have fewer bones than their fishy ancestors, and over the years, the evolutionary changes in the amphibian family have gone in two directions. The frog family has a broad head, large eye sockets, short spine, no tail, and long hind legs. The caecilian group has skeletons with small tubular skulls, tiny eye sockets, long spines, and no legs at all.

The skeletons of salamanders and newts are adapted for a primitive form of walking. A frog's skeleton, on the other hand, is specially adapted for leaping and swimming. The backbone is the base of an amphibian's skeleton, and is made of vertebrae. Ribs still remain underdeveloped. By comparing the skeleton of modern amphibians with the fossils of ancient ones, it is possible to determine the era in which they lived.



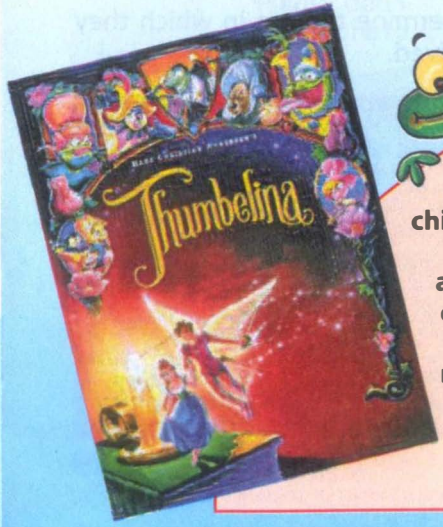
Skeleton of a Frog

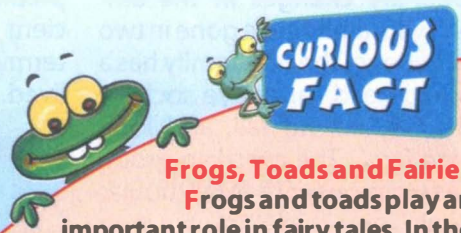


Caecilian

Why is it said that amphibians are found worldwide?

Amphibians are found all over the world, except in Antarctica and Greenland. They are found both on land, and in fresh water. Frogs are the common amphibians. You can find frogs in water, or near places that have water, like ponds and streams. However, some frogs will never enter the water. They live mainly on land. Then, there are some kinds that live in trees.





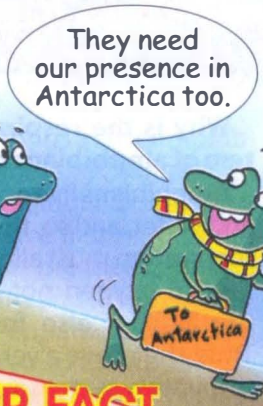
Frogs, Toads and Fairies

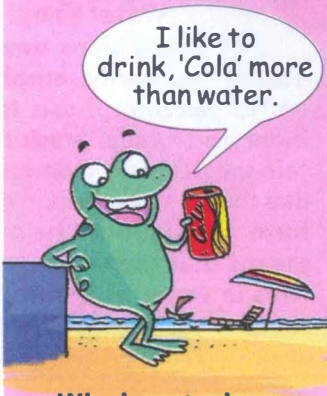
Frogs and toads play an important role in fairy tales. In the children's story 'Thumbelina' written by Hans Christian Anderson, a tiny flower fairy is kept a prisoner on a lily pad in the middle of a river by an ugly toad who wants her to marry his son. She finally manages to escape with the help of her friends, the fish, and marries the prince of the flower people.

Some frogs are burrowers. Frogs that live in cold places, hibernate during winter time.

Salamanders are found in North, South and Central America, Europe and Asia, and some species are found in Africa too.

Caecilians are found in swampy places in most tropical parts of the world.





Why is water important to amphibians?

For amphibians, water is essential for survival. To begin with, water keeps their skin moist, and they get the oxygen they need from the water that they absorb through their skin. Water is also vital for their reproduction.

STAR FACT

Life in Water

African clawed toads inhabit many of the rivers and streams of Africa. These aquatic, or water-living, toads almost never go onto land. Unlike many frogs and toads which breathe through their skin, African clawed toads breathe through large lungs. They get their oxygen by coming to the surface often for large gulps of air. They protect themselves from their many enemies by covering their bodies with a smelly slime.



African Clawed Toad



Water Baby!

Some amphibians never become adults! Ordinarily, amphibians undergo metamorphosis from egg to larva, and finally, to adult form. Certain species of newt and salamander, like the Axolotl, remain in the larval form throughout their lives. This means that they spend their entire lives in water as babies! This phenomenon is known as neotony.

STAR FACT

This is because the eggs of amphibians do not have a hard shell so they need water to keep them from drying out, and to protect them from the rays of the sun. Some species of amphibians are aquatic, and spend all their lives in water. Others spend the beginning of their lives in water as larvae, and later undergo a change called metamorphosis, and move on to land.

Since, water is so important to them, amphibians like frogs seek out damp shady places to live in. Others try to prevent water loss by burrowing underground. In spite of being so dependent on water, amphibians rarely drink it! Isn't that strange?

Why is the respiratory system of amphibians different?

Amphibians live on both land and water, and so, their respiratory system must allow them to take in oxygen not only from the air, but also from water. Thus, they have a very complex respiratory system.

When amphibians stay in the water, they breathe through their skin, but once they come on land, they breathe with their lungs, and through the membranes in their mouth. Even when the lungs are used, amphibians obtain oxygen through their skin- and for this to be possible, the skin must remain moist at all times.

When an amphibian is in the larval stage, it uses gills for breathing. These gills later de-

'Flying' Frog

The red-eyed tree frogs found in Mexico, Costa Rica and Panama fall in the category of 'flying' frogs. They are called so, because they can glide between the leaves and branches of trees in the rain forests. They are good climbers and insect eaters too.



velop into lungs as the amphibian undergoes the changes that make it an adult. Some salamanders have neither gills nor lungs, but breathe through their mouths and skins.

To sum up, amphibians can get oxygen into their bodies in three different ways. The first way is by using lungs, which are similar to ours. The second way is through their skin, and the last way, is by using gills. Did you know that amphibians don't breathe constantly like humans do? Instead, they just breathe now and then, when their body needs more oxygen.

Dart-poison frog Dendrobates





Phantasmal Poison Dart Frog

Why are amphibians very colourful?

Amphibians can be red, blue, yellow, brown, or green and they come with spots, stripes, and many different types of markings. Some are darker on top with a completely different colour and pattern underneath. An amphibian's colour may vary with humidity too, becoming pale when warm and dry, and dark when cold and damp.



Yellow Banded Poison Dart Frog

There are several reasons why amphibians come in different colours. A

Darken Down! Lighten Up!!

Amphibians change colour according to their background, as well as according to the temperature, light, humidity, and even their mood. The white's tree frog for instance, is light green in colour to blend in with the leaves around it. However, these frogs become darker and browner when the temperature drops and humidity rises. Their colour becomes lighter when they move to a sunny and less damp place.



Australian Green Tree Frog

Why do amphibians gobble their food?

Amphibians depend mainly on their eyesight for their food. They will eat almost anything that is alive which they can swallow or gulp down. Insects, slugs and earthworms form part of their everyday diet,



bright colour is used to tell other animals whether a particular animal is poisonous or not. Tropical colours like reds, oranges and blues are so bright that they can be seen from afar. These colours signal predators that the animal is poisonous, and shouldn't be eaten. On the other hand, some amphibians have bright colours to scare their enemies away. Many can change their colouring to mimic their surroundings, so that their enemies can't see them.

Some frogs can only change their bottom half into a tropical colour.

Blue Poison Dart Frog





while larger amphibians may eat small animals like mice. Some amphibians will even eat others of their own species!

Generallyspeaking,amphibians tend to swallow or gulp their food as fast as they can- and also to eat until they are stuffed. The reason for this is that, they want to eat as much as they can when food is plentiful, to make up for those times when food is scarce.

STAR FACT

Slow, Slow, Quick, Quick...

Newts and salamanders have their own technique for catching their prey. When they spot a nice fat earthworm- or any insect, they will approach it slowly, with the utmost stealth and care. Then, when they are near enough to the unsuspecting victim, they will turn their heads and make a quick grab for the tasty titbit.



Why are the senses of amphibians important for their survival?

Like us, amphibians have five senses- touch, taste, sight, smell, and hearing. In addition, amphibians can detect ultra violet and infra red light, as well as the Earth's magnetic field.

Amphibian senses are well developed. Frogs and toads have excellent sight, and depend on their eyes to find food. Salamanders have good eyes, and also a keen sense of smell. When they hunt for food, they use both sight and smell. For the burrowing life of caecilians, good eyesight is not a necessity. They either have very small eyes, or no eyes at all. Caecilians hunt mainly by smell. They have two tentacles, or feelers, near the mouth. As they move through the ground, the tentacles pick up food scents.

Amphibians are cold blooded, and need to respond quickly to changes in temperature and humidity. An amphibian's senses help it to respond to such changes. Its senses also help it to find food, find a mate and to avoid its enemies. Thus, the senses play an important role in an amphibian's survival.



Underwater Walking!

Tadpoles live in water, and they can even walk there, over rocks and plants. Nature may be giving them practice to hop when they come to live on land later, as frogs.





Mystery Sense Organ

Caecilians have eyes that are covered with skin or bones, making them practically blind. However, they have a small tentacle in front of the eye. Its function is a mystery, but it is thought that this tentacle is used to pick up vibrations or smells so as to help the animal find food, detect a mate, or avoid an enemy.

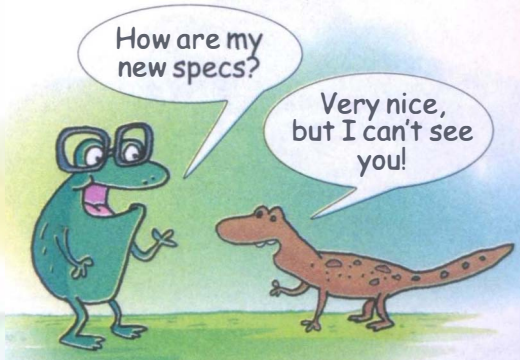


Eyes of Different Types of Frogs

Why are an amphibian's eyes different from those of other animals?

Since amphibians have been around a long time, and have adapted to a variety of environments, their eye structures vary slightly for different environments. The frog has large, bulging eyes, which sit at the top of its head. Its eyes bulge out so far that it can see in nearly all different directions, which is helpful for an animal that can't turn its head. A transparent inner eyelid called the nictitating membrane protects the frog's eyes when the animal is underwater. A frog can also shut its eyes completely. To do this, the frog pulls its eyeballs deep into their sockets. This closes the upper and lower eyelids together.

Most species of salamanders view their world with colour vision, but they see in the ultraviolet range, which is impossible for the human eye. Salamanders use this special vision adaptation to hunt prey. Some species of amphibians, such as the Texas blind salamander, live their entire lives underground in places like caves. These amphibians do not have eyes, since they live in complete darkness.



Hot and Cold!

Amphibians can sense changes in temperature and humidity through their skin. They can control their body temperature by basking in the sun when it is cold, and moving to the shade when it becomes hot. They also control their body temperatures by reducing the amount of body surface that they expose to the sun.



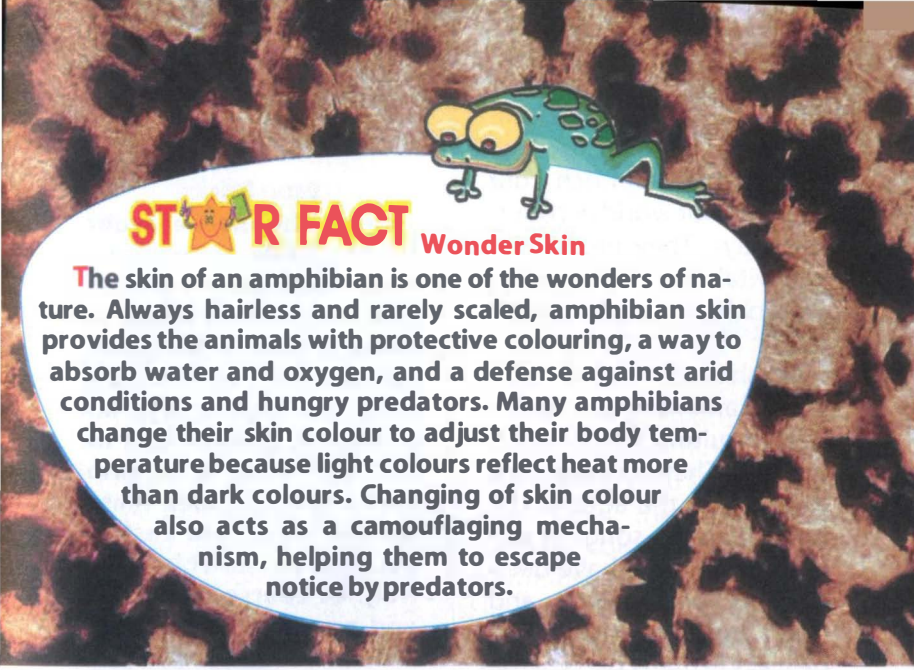
Why does hearing vary from amphibian to amphibian?

Amphibians hear very well- they can even hear sounds which we can't hear. If you look closely at a frog, you will see small circles covered with a membrane behind its eyes, on the side of its head. This membrane is the frog's eardrum. Sound waves in the air make the membrane vibrate. The vibrations are transmitted to the inner ear, and from there to the brain, which recognizes it as a sound.

Not all amphibians hear in this way. Burrowing, limbless amphibians pick up vibrations through their lower jaw. Salamanders lack middle and external ears, but have inner ears that can process sound. In some species of salamanders, sound causes the animal's chest to vibrate, and the vibrations are carried by air from the lungs to the animal's inner ear.



Frogs 'Ear'



STAR FACT Wonder Skin

The skin of an amphibian is one of the wonders of nature. Always hairless and rarely scaled, amphibian skin provides the animals with protective colouring, a way to absorb water and oxygen, and a defense against arid conditions and hungry predators. Many amphibians change their skin colour to adjust their body temperature because light colours reflect heat more than dark colours. Changing of skin colour also acts as a camouflaging mechanism, helping them to escape notice by predators.

Why is it said that amphibians taste with their skin?

Taste buds send flavour messages to an animal's brain. All amphibians have taste buds on the skin lining the mouth and tongue. However, an amphibian's skin is special in that it allows water and oxygen to pass through it. The skin of amphibians also has certain cells that allow it to 'taste' food!



Taste and smell are closely connected. Taste is more important to amphibians than reptiles, because reptiles rely more on their sense of smell to locate their prey. Amphibians, on the other hand, depend more on their eyesight to locate sources of food. The taste buds of amphibians are actually groups of hair cells and each group is sensitive to one of the four basic tastes- saltiness, sourness, sweetness, and bitterness.

Why are amphibians important to man?

Amphibians enrich our lives and our world in countless ways. They provide us with vital medicines, including analgesics and antibiotics.

Amphibians have also played an important role in human culture, from religion to fables. They have featured throughout the ages in the form of poetry, songs or stories. Amphibians have been a good food source, and frog's legs are considered a delicacy in many parts of the world.

Amphibians are also indicators of environmental health. They are called indicators because they are very sensitive to changes in their environment. Amphibians are sensitive because they breathe through their skin, and this means that they breathe in even minute traces of harmful stuff around them. If pollutants are around them, they breathe it in, and get sick or die. So, if you see lots of dead frogs or toads in an area, stay away or tell someone.

STAR FACT

Frog Prince

One of the all time favourite fairy tale is that of a beautiful princess who kisses a frog, and by doing so, turns it into a handsome prince. The princess disliked the frog at first, but gradually, grew to care for him. By kissing it, the princess broke the spell that a wicked witch had cast on the prince to turn him into a frog. Of course, the prince and princess married each other, and lived happily ever after! The story was written by the Grimm brothers.

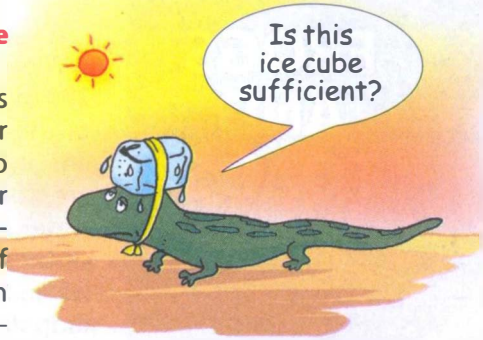


Why do amphibians face many problems on land?

One of the greatest dangers amphibians face, is that of their skin drying out because of too much exposure to the sun. Their soft skin provides little protection against dehydration. If their skin dries up, they soon die. So amphibians inhabit regions that have plenty of dew and moisture.

Where temperature becomes high, and humidity low, or where dry and rainy seasons alternate, some amphibians become inactive until conditions are again favourable. Some are active by day, while others move about at night. Their activity is also influenced by temperature and humidity.

The enemies of amphibians include foxes, hedgehogs, storks, herons, snakes, and large spiders. Amphibians respond to danger in several ways. Some



dive into water or hide in dens. Others pretend to be dead, or camouflage themselves by changing colour. Others protect themselves with poisonous skin secretions, or puff up to look large and frightening.

Humans are the most serious threat to amphibians. They are often destroyed when people drain marshes to kill mosquitoes and other insect pests. Amphibians are eaten in some countries and frog legs are a delicacy. Many amphibians are used in scientific experiments.



Singers on Trees

Treefrogs are singers among the amphibians. Their favourite sites are in trees high above the ground. Males among the North American tree frogs sing to attract their females.



FROGS AND TOADS

What are frogs?

The first true frogs evolved about 200 million years ago during the time of the dinosaurs. Frogs are amphibians- in fact, about 90 % of amphibians are frogs. They spend their lives near water, because they must return to the water to lay their eggs. Frog eggs are laid in the water. When they hatch into tadpoles, they breathe with gills, and swim using a tail. As they mature, they lose their tail, develop lungs for breathing air, and live on land. Though adult frogs have no tail, they have well developed hind legs, and are experts at leaping and jumping. They are found on every continent







STAR FACT

Variety is the Spice of Life

The world's smallest frog is the Monte Iberia Eleuth frog of Cuba (8.55 mm). The Brazilian, Gold frog is just 9mm long and can fit on your fingernail. The quick moving northern leopard frog has spots that help it to hide among leaves and in ponds. The common frog's skin may be green, brown or mottled, while the huge North American bullfrog loves a meal of fish and small birds. The biggest frog is the goliath frog and its body is 40 centimetres long.



Sudden Shock

The Chilean four-eyed frog has a pair of eyespot marks on its rear end.



Four-eyed Frog

They are really big poisonous glands with spots on them, but they look like eyes when you look at them from behind. The spots are usually covered by the thighs when the frog is sitting, but when it feels any threat, it will raise its rump to expose the 'fake eye spots' and cause them to swell up a bit. This shocks the predator into thinking that the frog is bigger and meaner than it really is!

except Antarctica. There are thousands of species of frogs and they come in all shapes, colours and sizes.

What are the differences between frogs and toads?

Frogs and toads are both amphibians, and they are very similar. There are some differences however. Frogs generally have bulging eyes, strong long webbed hind legs for leaping and jumping, and smooth or slimy skin. Frogs also usually lay their eggs in clusters. Toads, on the other hand, have stubby bodies with short hind legs, and warty and dry skin. Their eyes are less bulging and more football shaped, with poison glands behind them. Toads move in short hops and jumps, and they lay eggs in long chains. However, there is really no hard and fast rule. Toads belong to the frog family, but they are not true frogs. To make things more complicated, it is not uncommon, for example, to find a warty skinned frog that isn't a toad, or even a slimy toad!





Asian Painted Frog

Why is the frog's skin special?

Frogs have very special skin- it not only protects them but they drink and breathe through it. Frogs don't usually swallow water like we do. Instead they absorb most of the moisture they need through their skin. They also get extra oxygen from the water absorbed through their skin. So it is important for frogs to keep their skin moist or they might suffocate. Sometimes you'll find frogs that are slimy. This is because the frog skin secretes mucus that helps keep it moist. Even with the slimy skin, these frogs need to stay near water.



Frogs shed their skin regularly to keep it healthy. Some frogs shed their skin weekly, others as often as every day. To do this, they start to twist and turn so as to stretch themselves out of their old skin. Finally, the frog pulls the skin off over its head, like a sweater, and eats it!

STAR FACT

Stone Frogs

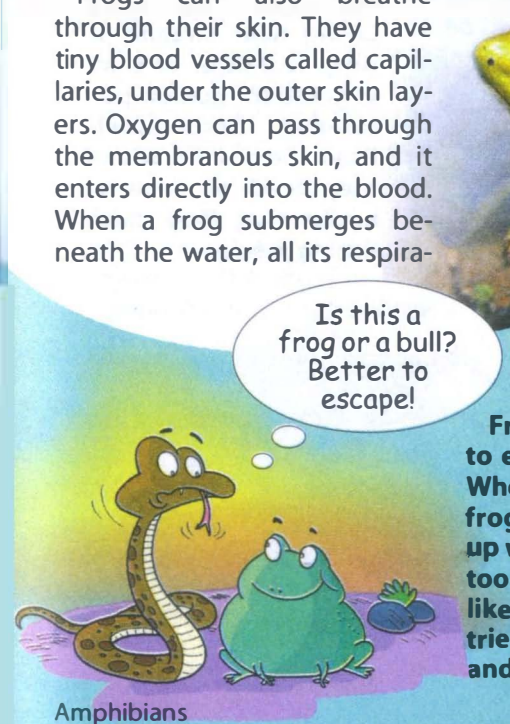
The Asian painted frog has a back which is coloured a rich mahogany brown, with a cream band down each side, usually with a darkish edge. It is round shaped, and doesn't have much of a neck, so it looks somewhat like a stone, which is an excellent disguise to fool its enemies. Painted frogs hide under leaf litter during the day hours, and eat in the evening.

How do frogs breathe and feed?

All frogs start life as aquatic tadpoles, breathing underwater through internal gills and their skin. They later develop into land animals with lungs for breathing air. But in all stages, breathing is controlled by movements of the throat. Their throat movements pull air in through the nostrils to the lungs. They breathe out with body contractions.

Frogs can also breathe through their skin. They have tiny blood vessels called capillaries, under the outer skin layers. Oxygen can pass through the membranous skin, and it enters directly into the blood. When a frog submerges beneath the water, all its respiration takes place through the skin.

Frogs are carnivorous, which means they eat other animals. Small frogs eat insects, worms, and snails. Some species eat small fish. Larger frog species eat small reptiles and mammals, like mice and lizards. Certain frog species have a long sticky tongue that they use to catch flying insects. Frogs do not chew, and all of their prey is swallowed whole.





AMAZING

As Big as a Bull!

Frogs have many techniques to escape from their enemies. When threatened, tomato frogs will just puff themselves up with air. Then they become too big to be swallowed! Just like in the story where a frog tried to become as big as a bull, and exploded!

Why is the frog the common specimen for dissection in college laboratories?

The main reason for the frog being chosen for the laboratory is that it has a similar orientation to the human body.

When students take a look into the anatomy of a frog, they can become more familiar with the inner workings of our own body. The frog also has an intricate internal structure that displays all the major bodily systems. Apart from this, the frog is available in plenty and is small enough to be handled easily.

Golden Poison Dart Frogs



AMAZING

Poisonous Frogs

The golden poison dart frog is bright yellow in colour and very, very poisonous indeed. Its bright colours advertise its poisonous nature and its toxin, batrachotoxin, can kill many small animals or humans. These frogs are found in Colombia along the western slopes of the Andes. Living near streams in deep leaf-litter or thick vegetation, golden poison-dart frogs rarely leave the ground, where they feed on invertebrates that they catch during the day.



A Frog in its Transition Stage from a Tadpole

What are tadpoles?

Frogs lay their eggs in water or wet places. The egg begins as a single cell. Several thousand are sometimes laid at once. Gradually, a jellylike covering develops, which protects the egg. The single cell in the egg eventually splits into two. These two split making four cells, and so on. Eventually, there are many cells in the egg. The mass of cells in the egg come to form an embryo. Organs and gills begin to form, and in the meantime, the embryo lives off its internal yolk.



A Tadpole

After 21 days, the embryo leaves its jelly shell, and attaches itself to a weed in the water. This quickly becomes a tadpole, which is a baby frog. The tadpoles grow until they are big enough to break free into the water. This can take from 3 days to 3 weeks, depending on what kind of frog they will become. The tadpole has a long tail, and



Skunk Frogs

Skunk frogs are very rare frogs. When provoked, the skunk frog produces a smell from its skin- and the smell is horrible enough to drive enemies away! It is the largest member of the poison dart frog family, and its claim to fame lies in its stink!

Why are frogs amazing creatures?

A frog's body structure is unique in many ways. To begin with, it has two bulging eyes, long, strong webbed feet that are adapted for swimming and leaping, and a moist, slimy skin. Their eyes are special, because, frogs can have different types of eyes- with round pupils, horizontal pupils, vertical pupils and even heart shaped pupils. They also have a special tongue that unfurls rapidly to catch food- and they swallow this food by pushing it down their throat with their eyeballs! Frogs have two kinds of teeth, but they don't chew. They swallow their food whole, and the teeth just hold the food while the eyeballs push it down.

Different species have different types of feet – did you know that they are the farthest jumpers in the world? Their skin is pretty unusual too - they use it for drinking and breathing. Now, don't you agree that frogs are truly amazing creatures?



lives in the water. It is extremely vulnerable, and must rely on its camouflage to protect itself.

After about five weeks, the tadpole begins to change. Over time, the tadpole becomes more and more froglike. Eleven weeks after the egg was laid, a fully developed frog with lungs, legs, and no tail emerges from the water.

Why are a frog's eyes and ears special?

A frog has large, bulging eyes, which sit at the top of its head. The eyes play vital roles in capturing food and avoiding enemies. The bulging eyes allow the frog to see in front, to the sides, and even partially behind! The eyes positioned on top of the head give the frog 180 degree field of vision. This helps the frog to spot its enemies and prey very quickly.

Frogs have variable kinds of eye types. The coloured part of the eye is called the iris. They can be brown, green, silver, red, bronze, and even gold. The pupils come in all kinds of shapes too- round, horizontal, vertical and even heart shaped. Some frogs have triangular pupils, and some even have star-shaped pupils. Most frogs also have a nictitating membrane, or a sturdy film that covers and protects the eye while the frog is underwater.

Frogs don't have external ears. Instead, they have an eardrum called the tympanum that sits just behind the eye. Tympanum means drum. Often, you can see the eardrum- it's a flat area surrounded by a ring of cartilage. Sound waves vibrate the eardrum, which wiggles a rod connected to the eardrum. This sloshes fluid in the inner ear, which waves hairs in hair cells. The hair cells contact nerve fibres, which generate electrical pulses. Nerve fibres carry the signals to the brain, which interprets the nerve signals as sound. When a frog hears noises, not only does the eardrum vibrate, but its lung does too!

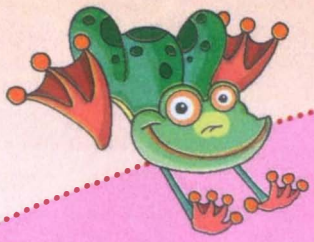




Why is it interesting to watch a frog capture its prey?

Sight is the most important sense a frog uses in hunting. Frogs will typically sit motionless once a prey is sighted, until it comes within striking distance. Then, the frog will leap forward and flick out its tongue with lightning speed. When a frog flicks its tongue, it rubs it across a gland on the roof of its mouth, which coats the bottom of the tongue with a sticky secretion. The tongue hits the prey, which sticks to it like glue, before it is moved into the frog's mouth. Not all frogs have tongues. African tongue less frogs eat underwater by opening up their mouth, and using suction to pull in prey.

Frogs swallow their prey whole. Most use their eyeballs to push the prey down their throats. Some also use their fingers to help stuff larger prey into their mouths.



AMAZING!

A Frog's Nostrils

A frog's nostrils are primarily for breathing through rather than for smelling, as frogs breathe with their mouths shut. Frogs do have a strong sense of smell which they use to find mates. However, most of a frog's odour sensitive cells are found on the roof of the mouth, rather than in the nostrils.

Why are the tongues and mouths of frogs unique?

Frogs have large mouths, and though they do have teeth, they swallow their prey whole. A ridge of small, cone-shaped teeth around the upper edge of the jaw, called maxillary teeth, helps some frogs grip large, struggling prey. Frogs also have a pair of teeth on the roof of their mouth; pointed toward the throat, that help keep the struggling prey from escaping. Most frog meals, however, are so small that the teeth are not even used.



The frog catches its food – mainly flies or other insects, and small animals like spiders, earthworms and minnows – with its long, sticky tongue. Mucus glands in the mouth produce the sticky substance that coats the tongue. At rest, the tongue is folded on the base of the mouth with the tip pointing back toward the esophagus. When prey is spotted, the frog flips its tongue out very rapidly, hitting its prey with amazing accuracy.

Did you know that a frog's tongue is about one-third the length of its body? Unlike your tongue, a frog's tongue is attached near the front of its mouth and the tongue folds back toward its throat.

Why are some frogs called tree frogs?

As you can guess, tree frogs are called by this name because they make their home in the branches of trees. Some inhabit smaller plants, and a few species are ground-dwellers. Tree frogs are found in most parts of the world. They vary in length from less than two and a half centimetres to more than ten centimetres.

Tree frogs are very agile, and can climb quickly. How do they do this? They have pads at the ends of their fingers and toes. These pads help in climbing, because they are rough and are covered with a sticky secretion. Some tree frogs have claw-



Red Eyed Tree Frog



Cuban Tree Frog

STAR FACT **Lazy Hunter**

The African bullfrog is a lazy hunter. It does not go in search of prey- it just sits in one place, and waits for a prey to approach within striking distance. It will then attack, and swallow the prey in a single gulp! It will feed on anything it can fit into its mouth; including insects, small rodents, reptiles, birds, and amphibians -including otherfrogs.



shaped fingers and toes, and most kinds have webbed hands, webbed feet, or both. Many tree frogs can change colour, usually to match their surroundings. As winter approaches, tree frogs burrow into the humus on the forest floor. Their tissues and body fluids are protected from freezing by glycerol, made in the frogs' cells.

Tree frogs are noted for the loudness and variety of their calls, made only by the male. Most tree frogs lay their eggs in water. There are three main families of tree frogs that include the so-called flying frogs. Actually, flying frogs don't fly- they just glide from tree to tree.

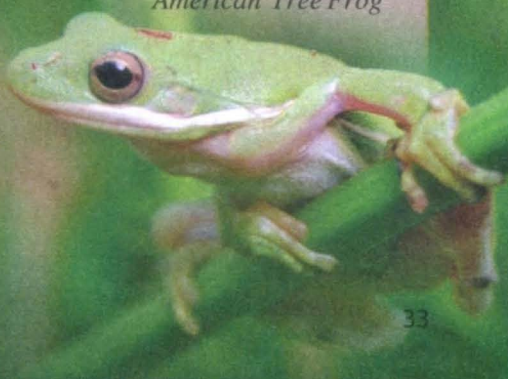
Grey Tree Frog



Tree Top Frogs

Tree frogs probably started living in trees to escape from their enemies. Moreover, there was always a plentiful supply of insects amongst the leaves and branches to provide them with a steady source of food. Early frogs that were good at grasping tall grasses, roots and stems were probably the ancestors of our present day tree frogs. Did you know that many tree frogs have bright green colour with blue and yellow stripes. The green colour makes them difficult to spot among the leaves, flowers and fruits of trees?

American Tree Frog



Why are some frogs called glass frogs?

The glass frog is a tiny frog that gets its name because of the translucent skin on its underside that allows you to see its inner organs, right down to its beating heart! This translucent skin makes the glass frog very difficult for predators to spot, as it almost becomes a part of the leaf it is sitting on.

Glass frogs are very small, the average one being between 1.4 centimetres and 3 centimetres, and they generally live in the rainforests of Central and South America. They are at a high elevation, so these rainforests are called cloud forests as the canopy is wrapped in cloud - and this is a further reason for which the glass frog's transparency is very useful. Although they live by streams and rivers, almost all glass frogs live in trees, only coming lower down to breed.

Hourglass Tree Frog





Stowaway Frog

The stowaway frog is found in Trinidad and Tobago and the North Coast of South America as well as in the Amazon area. Do you know why it is called by this name? It is because the creature is so small that it hides among bananas, and is then sometimes accidentally exported to other countries!



STAR FACT

Green Songster

Tree frogs make a variety of sounds and they are so loud too.

Scientists have discovered that, male frogs actively tune the pitch of their calls to resonate inside hollow tree cavities, and the effect is similar to organ pipes.

Males will use extra energy on their call to increase the tempo, and prolong the duration of each call.

Why are poison dart frogs important?

Poison dart frogs show off some of the most brilliant and beautiful colours on Earth. Their colouring can be yellow, gold, copper, red, green, blue, or black, depending on where they live. There are more than 100 species of poison dart frogs, varying in colour and pattern. The black and green species have black spots, the strawberry or blue jeans frog is all red with blue legs, the yellow-banded species appears painted with yellow and black. Colour shades vary among frogs within a species. It is the skin that contains the frog's poison.

The bright colouring of the poison dart frog serves as a warning to potential predators that it is one of the most poisonous animals on Earth. From tiny pores in its skin, the frog secretes a defensive toxin, which

Dyeing Dart Frog

could easily kill, if injected into a human, or other animal. In fact, the five centimetre long golden poison dartfrog has enough venom to kill 10 grown men!

Many of the toxins secreted from the skin of the poison dart frog have unique effects on nerves and muscles. For this reason, frog toxins have become important tools in biomedical research, aimed at better understanding and treatment of neurological and muscular disorders. So someday, your life may literally be saved by a frog!



AMAZING

Poisonous Arrows

The Golfodulcean poison dart frog is found in Southwest Costa Rica. Its skin secretes a very toxic poison, which is used by forest tribes to coat their arrows. The frog is first impaled on a stick,

Why are mantellas important to Madagascar?

Tiny mantella frogs are among the most brightly coloured and spectacular of all frogs. They

STAR FACT

Barking Tree Frog

The barking tree frog can be found in the Southeastern United States. It spends a good deal of its time climbing trees. It gets its name from the loud barking call emitted by the male when it rains. This call sounds a lot like the bark of a small dog.

Barking Tree Frog





and then held over a fire. The heat drives the toxins from the skin in the form of a waxy froth, which is then wiped carefully on the heads of arrows.

These arrows paralyze their victims, and are ideal for hunting monkeys that scamper high up on trees.

come in many colours- inky black with brilliant splotches of orange, bronze, yellow, blue, or emerald green. By having the bright colours of the more toxic species, the frogs are avoided by predators. Mantellas secrete enough toxins to make a predator sick or, at the very least, they can make themselves taste quite bad!

Most frogs have webbed feet to help them swim, but not mantellas! Because they spend their lives crawling around on land or in leaves instead of swimming, there is no need for webbed toes. They also have short legs designed more for climbing than for long hops.

Mantellas are found only on Madagascar, off the eastern coast of Africa. Like all amphibians, mantellas have skin that soaks up water. If something happens to change the water, amphibians are one of the first species to feel it. Mantellas are important to Madagascar because their health can help scientists determine the health of Madagascar's rain forests, air, and waterways.

Golden Mantella



Why are the food habits of frogs so interesting?

Frogs will eat almost anything they can catch–but only if it's still alive. Most frogs eat insects, snails, and tadpoles. Large frogs will also eat small mammals, birds, fish, and reptiles. Most frogs hunt for food at night and hide during the day. Frogs don't drink water at all, but simply absorb it through their skin.

Frogs depend on their excellent eyesight to spot their prey. Once they sight it, a frog will even leap out of the water to catch its meal.

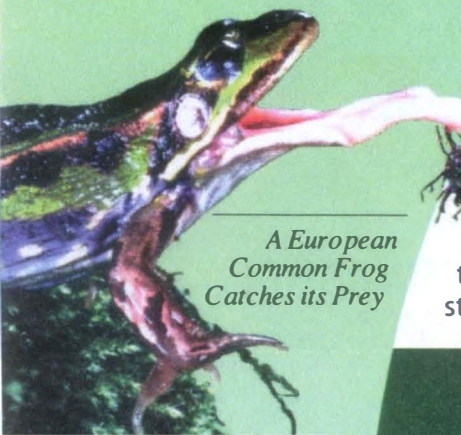
The frog will usually unfurl its long tongue that is coated with a sticky substance with lightning speed. The prey sticks to the tongue and is swallowed whole.

Though frogs have teeth, they do not chew their food. Their teeth are used only to hold the prey in place, and to keep it from escaping.



What are the different ways that frogs move on land?

Frogs generally jump or hop to move about. 'Rocket frogs' are so called because of how fast and far they can jump. The black-spotted tree frog is only 3.4 centimetres long, but can jump a staggering 1.5 metres! However,



A European Common Frog Catches its Prey

If a frog eats something poisonous, it is not too bothered. It just brings its whole stomach out of its mouth, and wipes it clean with its foot!



A Frog Swallows an Earthworm

some frogs like walking frogs, get around only by walking slowly. And narrow-mouthed toads creep and crawl to their destinations. Frogs and toads have only five to ten vertebrae and almost no neck. Their front and back are fused together, and so are the two bones in their ankles. This helps them to leap, as it reduces the stress on the bones.

Some frogs have webbing between digits to aid swimming. And the flying frog can actually glide from tree to tree with its modified webbing. Tree frogs have sticky, sucker-like discs on their hands and feet that help them to climb, and to cling on to vegetation.

Generally speaking, frogs move better in water than on land. A few burrowing species have short hind legs and cannot hop, but all other frogs have long, powerful hind legs, which they use for jumping. Did you know that many frogs can leap 20 times their body length on a level surface?

Rocket Frog





Swimming Stars

Frogs that live in. or near water have webbed toes on their hind feet. The webbing helps them swim quickly through the water. While swimming, frogs and toads propel themselves by kicking water backwards. They draw their hind legs upwards towards their bodies, and then shoot the legs outwards in a straight line. At the same time, they bring their front legs to their sides to get a streamlined shape.

A Common Frog Leaping into the Water



Why are the legs and feet of a frog special?

The legs and feet of frogs are adapted to where they live. We know that there are ground-dwelling frogs, aquatic frogs, arboreal frogs or those that live in trees, and burrowing frogs. In each case, the structure of their legs and feet vary greatly.

The legs of ground-dwelling frogs are designed for jumping. The three core bones of the hind leg are fused into a single, strong bone, and the limbs are elon-

Mixed Up Frog

The South American paradoxical frog is a mixed up creature. The tadpole is larger than the adult frog- in fact, it owes its name to an uncanny ability to shrink as it grows older. Another unusual feature is that the adult frog's fingers and toes have an extra bone each, making the hands and feet very long indeed.

CURIOUS FACT

gated, allowing the frog to apply force to the ground longer.

Burrowing frogs have short, muscular hind legs that they use primarily for digging. They also have a special hardened plate on each foot that they use like a shovel to dig through soil. Tree frogs have sticky pads on the tips of their fingers and toes that help them grip tree trunks and branches. Some tree-dwelling frogs have specialized webbing between their toes that they used for gliding. Aquatic frogs have webbing too, which makes their swimming easier.

Giant Burrowing Frog



STAR FACT

Getting to Top

Some tree frogs have no webbing at all on their feet. Instead, these frogs have sticky pads on the ends of their toes. These pads contain mucus that helps the frog to stick to a surface. That is why the little White's tree frog is able to climb up a nearly vertical pane of glass!



A Seep Frog from Borneo Covered in Mud

Why is camouflage important for frogs?

Frogs live in swamps, forests, and other places. These places are filled with the prey they need as food. More notably, these places also abound in predators which need frogs as food! Frogs have several enemies- snakes, otters, herons, badgers, hedgehogs and many other animals. Frogs therefore rely on the art of camouflage to avoid getting spotted by their enemies. Some blend with their backgrounds, while others even change colours to match their backgrounds!

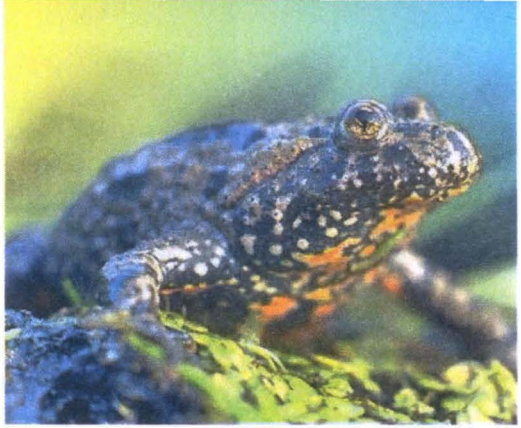
The aim of camouflage is to break up the typical frog shape, so that the frog cannot be distinguished from its surroundings. That is why, very often, frogs are a mixture of browns and greens that make it difficult for a predator to determine where the frog ends, and the surroundings begin!

Tree frogs are usually light green so as to blend in with the leaves, while a tree frog from Brazil looks like a splash of bird droppings on a stone! The Asian horned toad's colour matches that of the dried leaves and leaf litter on the forest floor, while it is practically impossible to see an African square marked toad if it remains perfectly still against a tree bark! In short, camouflage is important to a frog as it allows the amphibian to melt into the background and become practically invisible when danger approaches.

STAR FACT

Poison Glands

Toads secrete a milky white toxin from poison glands situated behind their eyes. When they are threatened, they squeeze this poison on to their skin- they can even squirt it up to a distance of two metres. The poison causes a burning sensation, muscle spasms and breathing difficulties.

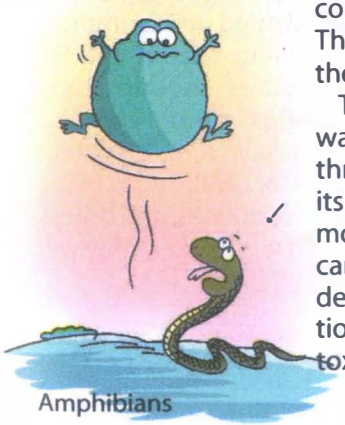


European Fire Bellied Toad

Why are toads experts in self defense?

Like frogs, toads also use camouflage as a form of self defense. The fire bellied toad is a green toad with black spots that blends nicely with the leaves and greenery of its habitat. However, its underside is a bright red and black- and this colouring gives this toad its name. Fire bellied toads secrete toxins from their skin, and they want potential predators to know it. When threatened, they rise up on their front legs and arch their back, and flip themselves over completely to display their fiery bellies. This is a clear warning to predators to keep their distance, or risk being killed!

The common European toad bluffs its way out of dangerous situations. When threatened, it stands on its toes and inflates its body with air making it look larger and more dangerous than it actually is. Toads can also excrete a fluid that acts as a self defense against any predators. That excretion may be foul tasting, or have a very mild toxicity.



STAR FACT

Island Frogs

The Hamilton frog is found only on two islands in the Cook Strait of New Zealand. One group lives in a pile of rocks known as frog bank on Stephen's Island while the other is found in a small patch of forest on Maud Island. These frogs are small, nocturnal, and camouflage themselves well making them very hard to see. Scientists believe that these frogs evolved about 200 million years ago, making them unique, as well as the most ancient frog species in the world.

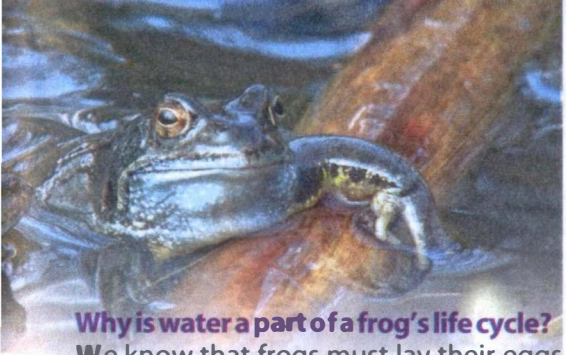


Why do frogs breed near water?

In cool climates, frogs generally breed in spring. This is because as the weather becomes warmer, water levels will rise in ponds, lakes and streams, and the warmer weather ahead allows the baby frogs or tadpoles to develop faster into adults. In the tropics, frogs generally breed during the rainy season as there will be sufficient water in all the pools and streams that had dried up in summer.

During a breeding season, the female frog produces around 2000 eggs. It lays its eggs in water because the eggs do not have a hard protective shell like bird or reptile eggs. They are laid in jelly-like masses, and unless they are covered with water, they will dry up and die.

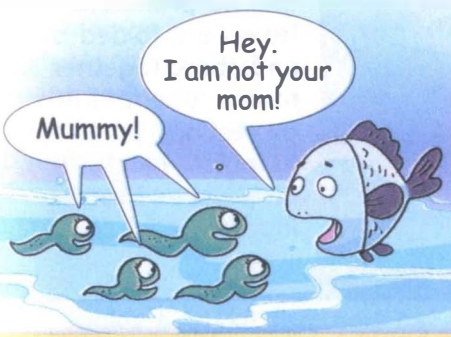
European Common Toad with its Eggs, which are laid in strings



Why is water a part of a frog's life cycle?

We know that frogs must lay their eggs in water, or otherwise, the eggs will dry up and die. A few days after they are laid, the eggs hatch into tadpoles. Tadpoles live under water, breathe through gills, and feed on algae and other tiny water plants. They have a head, tail, and body, and they gradually develop legs, lungs and lose their tails. Around twelve weeks old, they can come up to the surface, and breathe air directly into their lungs.

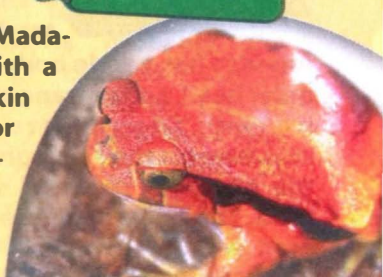
It takes about three months for a tadpole to develop into an adult frog. The adult frogs will live near the water, as they must keep their skin moist. They will also breed near water because the female has to lay her eggs in water. Water, therefore, plays a very important role in a frog's life cycle.





Don't Touch!

Tomato frogs, found on the island of Madagascar, are tomato red in colour, with a black eye line and green eyes. Their skin secretes a sticky goo and if a predator bites it, the goo will gum up the attacker's mouth, and glue its eyes closed. This gives the tomato frog plenty of time to escape!



Why do some frogs breed in unusual places?

Most frogs breed near water, but some do breed in unusual places. Tree frogs, for example, may lay their eggs in water, that collects in tree hollows- or even in flowers like the bromeliad flower. The vase like shape of this flower allows water to collect inside, and some tree frogs, who never come down from the tree tops, will lay eggs in that water.

African Reed Frog



The water will also be sufficient for a few tadpoles to develop.

Some of the larger tree frogs of South America dig holes in the ground that fill up with water for the females to lay eggs in, and tadpoles to develop. Some species attach their eggs to leaves that overhang rivers and ponds, so as to prevent the eggs from being eaten by ground predators. The leaves are folded over and stuck together to form a tube for further protection. When the tadpoles hatch, they drop from the jelly right into the water!

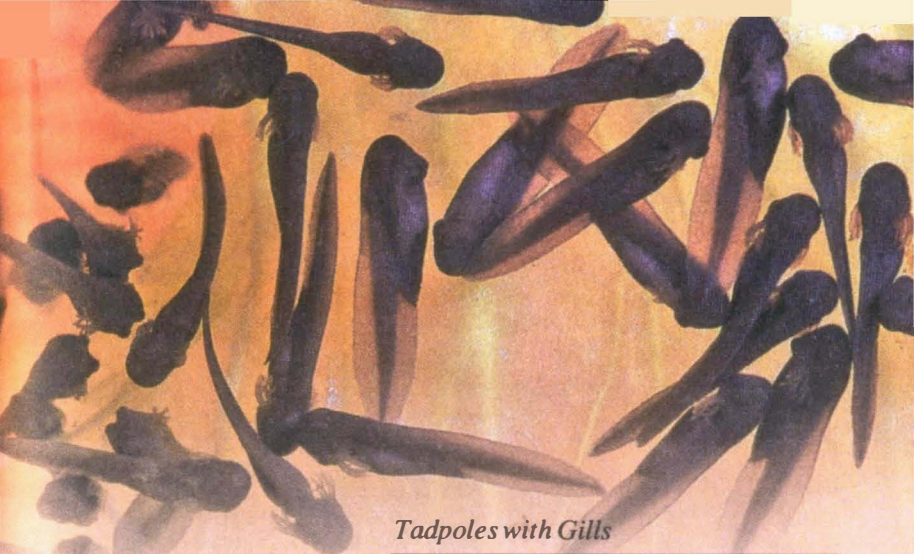


Delicate Fingers

The Surinam toad of South America has a wide body with a triangular head, and a strange appearance. Its long 'fingers' have star-shaped structures at their tips, giving the toad the alternate name of star-fingered toad. The fingers themselves are covered with tiny spines that help the adult to grip its prey firmly.



Surinam Toad



Tadpoles with Gills

Why do we say frogs undergo metamorphosis?

Metamorphosis is the change of shape during an animal's life. In frogs, it refers to the change from the larval or tadpole stage, into an adult frog. Frogs and toads generally breed in the pond where they were born. The eggs- sometimes there are thousands of them- are laid in clumps called frog spawn. Hatching takes place about six days after fertilization, and the babies or larvae are called tadpoles.

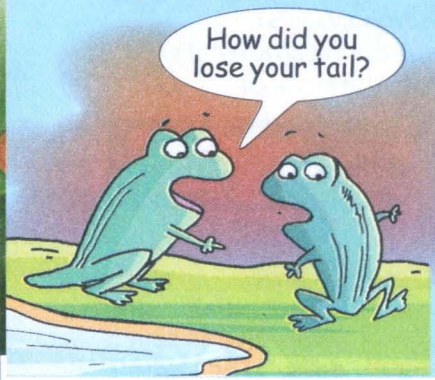
Tadpoles live like fish, and have a head, body, and tail. They live underwater, and breathe through gills. They feed on algae and tiny water plants. These tadpoles gradually develop hind legs, lungs, and front legs too. They lose their tails, and begin to look like little frogs. By the time they are three months old, tadpoles have completed the process of metamorphosis. They are now adult frogs that are capable of breathing through their lungs, and living on land.



African dwarf clawed toads shed their skin every five to seven days. The whole process takes only a few moments, and is probably the creature's way of getting rid of parasites that get into its skin.

What are froglets?

To put it in a nutshell, froglets are tadpoles that have almost lost their tails and that have developed legs. This happens when the tadpoles are around twelve weeks. Froglets still have a lot of growing to do before they are fully fledged adult frogs. Between 12-16 weeks, the froglet totally absorbs its stubby tail, and leaves the water.





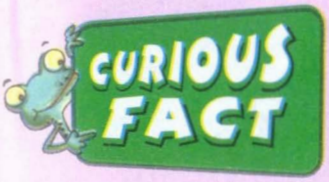
A Young Hyla Arborea Froglet

Sometimes, the term froglet refers to a frog that skips the tadpole stage and emerges as a fully developed frog. The Namaqua rain frog is one such frog. The eggs are laid in an underground nest, and metamorphosis takes place inside the egg capsules with the young emerging as fully formed froglets. The three toed Brazilian toadlet- which is not a toad at all but a frog- also have young ones that hatch directly from the egg.

Why do frogs lay eggs in varying numbers?

Generally speaking, frogs lay eggs in large numbers. However, this is not always the case. The number of eggs laid by a female frog depends on the way the eggs are fertilized, and an embryo is formed. It is this embryo that later develops into a baby frog or tadpole.

Normally, the female lays her eggs in water, and the male frog sprays his cells over them. This is called external fertilization. A great number of eggs have to be laid for external fertilization, because many of the eggs may not get fertilized at all. However, in



Rain Forest Discoveries

Rain forests contain more than 800 species of frogs. Tree frogs are very common in rainforests. They have got expanded circular discs under their fingers and toes, which enable them to climb. Many species are beautiful bright green, and have red eyes. Other famous frogs of the rainforests are poison dart frogs. These very brightly coloured frogs are found in Central and South America.



the case of some frogs, the eggs are fertilized inside the female's body. This increases the chance of fertilization actually taking place, and so, fewer eggs need to be produced.



Frog's Eggs

The number of eggs laid also reflects the amount of care that the parent frog gives. Those frogs that take more care of their young lay fewer eggs, as the babies have a greater chance of survival.

Most frogs lay between 1000 to 2000 eggs at a time-the American toad lays 4000 to 8000 eggs in one clutch. On the other hand, the tailed frog lays only 28 to 50 eggs per clutch, while the Cuban frog lays only one egg at a time!



Great Grey Tree Frogs Making a Large Foam Nest

Why are some frogs and toads considered good parents?

Usually, the female frog lays her eggs in water- often in underwater plants. She and the male then leave the eggs alone to develop on their own. In some species, one of the parents stays behind to watch over the eggs and care for the tadpoles.

Some frogs build nests of different types for their eggs. An Australian frog builds a foam nest made by churning a mixture of water and mucus to trap air bubbles. Large circular nests of sand and gravel are con-



Midwife Toads

The midwife toad gets its name from the male's behaviour. Females lay a string of eggs that the male wraps around his hind legs. He carries them until they are ready to hatch, and finally deposits them in a pool of water where the tadpoles remain for up to a year.





STAR FACT

Hitching a Ride

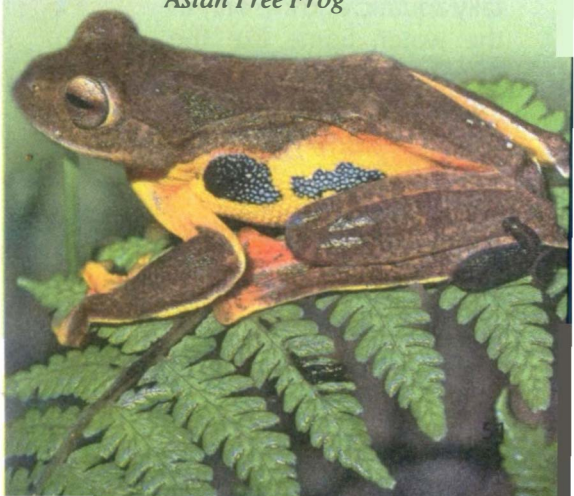
A non poisonous little frog found in Trinidad is a very good parent. The male stays with the clutch, and guards the eggs until they hatch. He then carries the entire brood of tadpoles on his back to a nearby stream, where they will develop into adult frogs.

structed at the edge of streams by the Latin American tree frog. Some frogs are very good fathers. The males carry eggs from a moist place, such as the water in a cupped leaf, to a wetter place, like a pond. They may do this by placing the eggs on their back, in a pouch on their belly, or even in their mouth. Some males wait for the eggs to hatch, and then transport the tadpoles on their backs. Male poison arrow frogs take their duties as a parent very seriously. They guard the clutch of eggs devotedly, and carry out vital transportation duties too. In the case of the Darwin's frog, the eggs develop inside the vocal pouch of the parent, and after hatching, emerge as young frogs, through the mouth!

How many species of frogs are there?

There are over 3500 species of frogs - and more are being discovered every year. Frogs have evolved in a wide range of sizes, shapes and colours that enable them to

Asian Tree Frog





African Bullfrog

Why should you be careful around an African bullfrog?

The African bullfrog is one of the largest frogs in South Africa. It measures up to 24 centimetres, and may weigh over two kilogrammes. It has a chubby body with a broad head, and has olive-greenish coloured bumpy skin. This frog eats lots and lots of really big bugs, fish, and mice. It has tooth like projections on its lower jaw to restrain struggling prey, and will eat pretty much anything that survive on land, water, and on trees. Some frogs are totally aquatic, and live only in the water. Some like the mole frog, cannot swim, and live only on land. Others live near ponds and streams, and are at home both on land, and water. But whether it is on land, water or on trees, frogs have mastered the art of survival through their camouflaging abilities, defensive mechanisms, and their adaptability.



STAR FACT

Doing Too Well

Cane toads are today a big nuisance in Australia. They were introduced into the conti-

thing that will fit in its mouth or that it can overpower, including lizards, and other frogs. The males of this species are known to give nasty bites, so be careful around them!



Asian Horned Frog

nent in 1935 to control the cane beetle that was destroying the sugar cane crops. Cane toads have done so well there that they have now become pests, and Australians are now worried about how to control them!

What are some unusual toads in the toad family?

Some toads are really unusual. The European common toad can be found across three continents, including Africa. They secrete a toxin that makes them unpleasant to predators. They sometimes stand up on their toes in a defensive posture. But they have no teeth, and aside from tasting bad and attempting to look menacing, these gentle creatures have no other defense. The Asian horned toad has fleshy horns projecting over its eyes that make it look exactly like a dead leaf, lying on the ground. The Asian tree toad has discs on its fingers and toes and horizontal pupils while the natterjack toads have special sounds that can be heard over several kilometres!

Asian Tree Frog





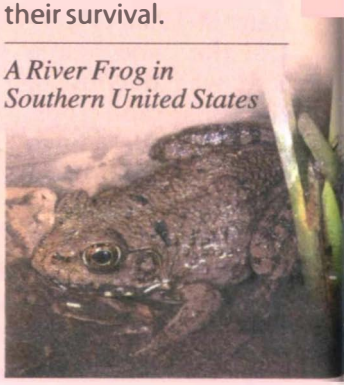
African Bullfrog in Kalahari-Gemsbok National Park

Why do we say that frogs adapt themselves to their habitat?

We know that frogs can be found on water and on land, on trees and even deserts. Aquatic frogs are those that live in water. They usually have well developed hind feet for swimming and nostrils positioned on the top of their heads. Their colours are generally dull, so that they cannot be easily seen by the many enemies that they have in the water. Aquatic frogs are found mainly in swamps and marshes as well as ponds and streams. Very few are found in large bodies of water like lakes, because most aquatic frogs spend at least some time on land. An exception to this is the African clawed toad.

Frogs that live on trees are arboreal frogs. They are found mostly in tropical forests and have sticky pads on their fingers and toes to help them in climbing. Their limbs are well adapted to jump from branch to branch, and even to glide from tree to tree. Those that live on the forest floor have tough skins and projections from their bodies to make them look like dead leaves or litter.

Not many frogs live in the desert because water is very important to a frog. However some species can be found in deserts too. They survive by burrowing underground and remaining hidden during very dry periods. The spade foot frog, for example, lives in an underground chamber that it lines with its own mucus and the skin that it has shed. So you see, frogs have been able to adapt to even hostile environments, and that perhaps is the secret of their survival.



A River Frog in Southern United States

Lifespan of Frogs

It turns out that very little is known at all about the natural lifespan of frogs. One reason is that it is pretty hard to track a frog all its life. Another reason is that frogs are usually eaten by predators before the end of their natural lifespan. In captivity, many species of frogs have lived between 4 to 15 years. Tiny tree frogs, and glass frogs usually live only for a year or two, while larger frogs live longer. Generally speaking though, frogs in the wild rarely die of old age- they are usually eaten by their enemies before that!



Ghost Frog in Africa

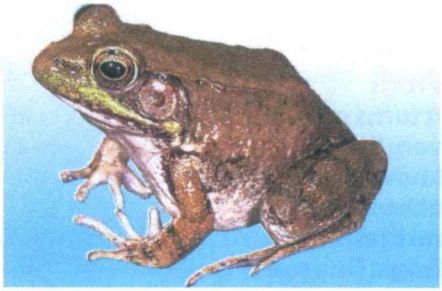
Why are some frogs known as ghost frogs?

There are just six species of frogs known as ghost frogs. These species are nocturnal, which means that they are active at night, and live in cool, fast-flowing mountain streams. The adults have adapted to their habitat by possessing well-developed pads on their fingers and toes for hanging on to wet rocks, and webbed feet for battling strong currents. The tadpoles avoid being swept away in fast currents by possessing sucker-like mouth-parts which they use to cling to rocks to avoid being swept away.

Ghost frogs are found in only in South Africa. They are rare, and as their natural homes are being destroyed by Man, they are in danger of being wiped out completely. Although the origin of the name is unknown, it is believed that they are so called this because some frogs are found in Skeleton Gorge on Table Mountain.

Why is it rare for frogs to travel great distances?

Frogs generally prefer to stay near their homes. They move around at night to search for food, and if spotted by their enemies, hide quickly. In fact, much of their lives are spent in hiding! When frogs do travel long distances, it is generally by accident. Tiny tree frogs have traveled half way around the world trapped in crates of bananas amongst which they were hiding. Tadpoles that cling to pond weed are also carried great distances when the weeds are plucked for aquariums in faraway places. Tornadoes sometimes pick up frogs from the water and whirl them along, to drop them from the sky, miles and miles away, giving rise to the story that it sometimes rains frogs!



Bronze Frog

Why are some frogs threatened?

In recent years, scientists have become increasingly aware of a worldwide decline in the numbers of frogs. There are many reasons why frogs are threatened. Herbicides suppress the immune system of frogs, so that they fall sick quickly and die. Frogs



Predicting Earthquakes

Did you know that common toads can sense that an earthquake is about to occur? They will flee their colonies days before the earthquake actually strikes. This evidence comes from a population of toads which left their breeding colony three days before an earthquake that struck L'Aquila in Italy in 2009. Scientists suggest that toads are able to detect clues such as the release of gases and charged particles in the atmosphere, and use these as a form of earthquake early warning system.

Frogs in Space

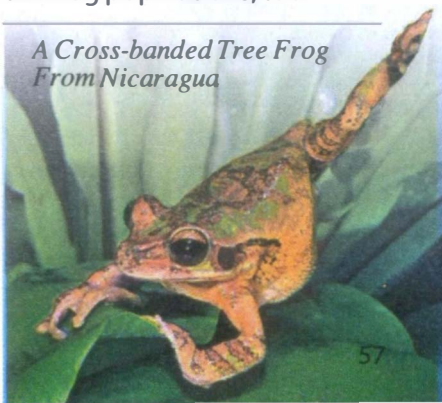
Frogs have also travelled in space. Six Japanese tree frogs were flown on Space Station Mir for 8 days, and their behaviour observed and recorded. In fact, frogs have been launched into space a number of times in the past, for many different studies. These studies help us to understand better how organisms adapt to gravity.



A Group of Male Golden Toads in Costa Rica. It is an endangered species.

are very vulnerable to chemicals in our waterways. Exotic species like plague minnows, trout, carp and goldfish that are introduced into ponds and lakes eat native frogs' eggs and tadpoles.

Climate change also affects frogs' population. Global warming dries out ponds and streams. Finally, humans are the frog's greatest threat. Land clearing and other disturbances have left frogs with fewer areas to live and breed in. Native frogs can be a food source for local people, as well as being used for the international pet and food trade. If levels of harvesting are high, this can threaten the frog populations, too.



A Cross-banded Tree Frog From Nicaragua

STAR FACT **Pond Predator**

The larvae of dragonflies are found in ponds and streams where frogs live. The larvae have a specialized lip that can extend to one third the length of its body to capture its prey. The dragonfly larvae eat tadpoles, and can seriously reduce the population of adult frogs in the area.



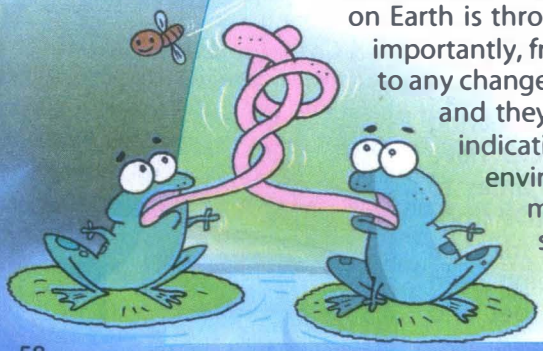


Dragonfly Larva

Why is the conservation of frogs important?

Frogs are our friends, and it is important that we take care to save them from becoming extinct. Tadpoles play an important role in keeping our waterways clean, by feeding on algae. They are also an important source of food for many animals.

Adult frogs eat large quantities of insects, and help farmers by eating the pests that destroy crops. Frogs are also an important food source for many predators, including snakes, birds, and even monkeys. Thus, if frogs disappear, the entire food chain on Earth is thrown out of gear. Most importantly, frogs are very sensitive to any changes in the environment, and they give us an excellent indication of the health of the environment. So let us remember that when we save frogs, we are protecting our wildlife and the Earth itself.





Skin care for Frogs

Frogs need to keep their skin moist. So when it rains, they take the opportunity to come out of their burrows and hiding places, and get their skin wet. That is why you will see more frogs on a rainy day- especially on the roads, where you normally do not see them.

Why are some frogs able to survive in very cold places?

Certain species of frogs live in very cold places, and they are able to survive the severe winters because they hibernate. Do you know what hibernation is? It is an inactive state resembling deep sleep in which certain animals living in cold climates pass the winter. Hibernation protects the animal from cold, and reduces the need for food during the season when food is scarce. During hibernation, the animal's heartbeat and



Eastern American Toad

A Garter Snake Swallowing a Frog



A Frog Preserved in Lab

CURIOUS FACT

Saving People

Frogs help to save lives because their skin gives off certain chemicals that help to heal sores, act as a painkiller, and cure certain diseases. Is it any wonder then that for hundreds of years, people living in rainforests thought that frogs had certain magical properties?

breathing slows down, and its body temperature drops to nearly match the outside temperature. Hibernating animals don't need much food because they are inactive- and also because they have glucose in their bodies for nourishment.

Aquatic frogs such as the leopard frog and American bullfrog hibernate underwater. They spend a good portion of the winter just lying on top of the mud at the bottom of a pond or stream. Sometimes, they are partially buried, and may even slowly swim around from time to time.



Terrestrial frogs normally hibernate on land. American toads and other frogs that are good diggers burrow deep into the soil, safely below the frost line. Some frogs, such as the wood frog and the spring peeper are not adept at digging, and instead seek out deep cracks and crevices in logs or rocks, or just dig down as far as they can in the leaf litter.

Frogs bodies have some kind of antifreeze chemicals in them. This allows some species to survive even after being frozen solid! Isn't that amazing?

SALAMANDERS



Spotted Salamander

AMAZING

Fire Salamanders

Fire salamanders are bright yellow and black in colour. It is believed that fire salamanders received their name because they hid in logs chopped for burning, and then ran out once the logs were placed on the fire. A myth grew up over this, and our ancestors believed that these creatures could not only withstand fire, but also that they lived in it!

What are salamanders?

Salamanders are amphibians like frogs and toads- but unlike frogs and toads, they have tails. They are found only in the Americas, and in the temperate zones of Northern Africa, Asia, and Europe. Salamanders have slender bodies, usually four legs, a small head, small eyes, and a tail. In some species the tail detaches when attacked. The tail will continue to twitch, distracting the predator as the rest of the salamander makes its escape. Salamanders have no scales, claws or external ear openings, and they lay eggs that are surrounded by a clear jelly.

STAR FACT **Shy Salamanders**

Salamanders are extremely shy animals. Land salamanders live in damp areas and hide out under fallen trees, logs, and rocks. Their shyness gives them an air of mystery- and perhaps, that is why there are so many myths about them!



Red Spotted Newt

What is the difference between newts and salamanders?

The differences between newts and salamanders are really minor. Newts are a subgroup of salamanders. All newts are salamanders, but not all salamanders are newts. The following are the things that distinguish newts from salamanders. Newts generally spend more of their adult lives in the water than salamanders. However, there are exceptions to this rule.

Male and female newts are distinctly different. They usually have rougher skin than other salamanders. Newts have three distinct life stages. They begin life in the water. They then undergo metamorphosis into an immature adult form that lives on land called an 'eft'. Finally, they return to the water where they attain full maturity.

Which are the tailed amphibians?

There are three main kinds of amphibians. They are the tailed amphibians, tail-less amphibians, and caecilians. Frogs and toads are tail-less amphibians, while newts and salamanders are tailed

A Young Tiger Salamander





A Common Newt

amphibians. Actually, all amphibians are born with tails, but frogs and toads lose their tails as they mature. Newts and salamanders keep their tails, and are generally found in the cooler regions of the world. Tailed amphibians have adapted to a wide range of different lifestyles. Some live near the water, and go into the water to breed. Land salamanders are often found under stones and logs. Some lungless salamanders live on trees, and have broad, flat, fully webbed hands and feet. Others live wholly in the water- but never in sea water.

Caecilians are another group of amphibians that have a very short tail and no limbs. They look like worms. Did you know that there is even a rare species of frog that has a tail? It is found only in North America.

Why do salamanders breed differently from other amphibians?

Different species of salamanders have different breeding habits. Some breed, lay their eggs, and hatch on land. But some other salamanders and some newts, breed and lay eggs in the water. When the eggs hatch, the larvae grow up in the water, and then return to the land as adults. Still other salamanders such as the giant salamander, spend all the stages of their life cycle in water. Lungless salamanders have eggs that hatch directly into small salamanders, skipping the larval stage entirely!

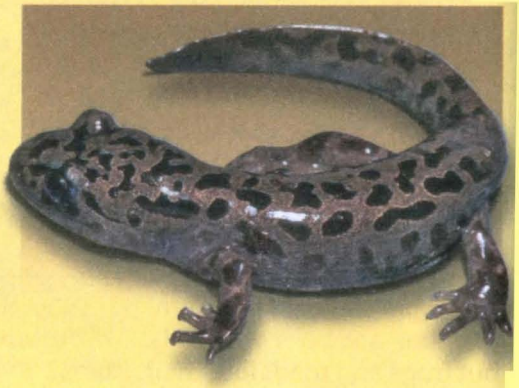


Marbled Salamander

Why are salamanders interesting?

An interesting fact about salamanders is that that most people think they are lizards- but they are not related to them at all. Salamanders are amphibians- they are related to frogs and toads. Like all amphibians, they share a few things in common with their frog and toad relatives, including moist skin, and the absence of claws on their toes.

Most salamanders lay their eggs in water. When the eggs hatch, the baby salamanders look more like tadpoles than salamanders, and are called 'salamander nymphs'. The nymphs have feathery gills that extend from the sides of their necks, and help the young salamanders absorb oxygen from the water. These nymphs feed on small animals and organisms that live in the water.



California Giant Salamander



Wet and Dry

Great crested newts have two types of skin. When they are on land, their skin is dry and warty. However, they return to the water to breed, and their skin then becomes moist and smooth!



Southern Torrent Salamander

The nymphs grow, and eventually develop lungs and the feathery gills slowly fade. When they have grown into adult salamanders they leave the water, and move onto the land, generally to moist areas like under logs and rocks near a stream. They eat a variety of small insects and other small animals without backbones including worms, spiders, and slugs. Some larger salamanders will eat smaller salamanders!

Do you know why you will never find a salamander basking in the sun? It is because they normally come out only after the sun sets. Another interesting fact about them is that salamanders do not make any sound at all- they are totally voiceless!



A Female Alpine Newt



Himalayan Newt

Jore Pokhri Wildlife Sanctury

Jore Pokhri Wildlife Sanctury is a habitat of the Himalayan newt. It is in Darjeeling, West Bengal. The Himalayan newt is a newt species found in South Asia and Southeast Asia. This is a small sized newt, growing up to fifteen centimetres. The number of newts here is very less.The preservation efforts in Darjeeling is helping to breed them in good numbers.

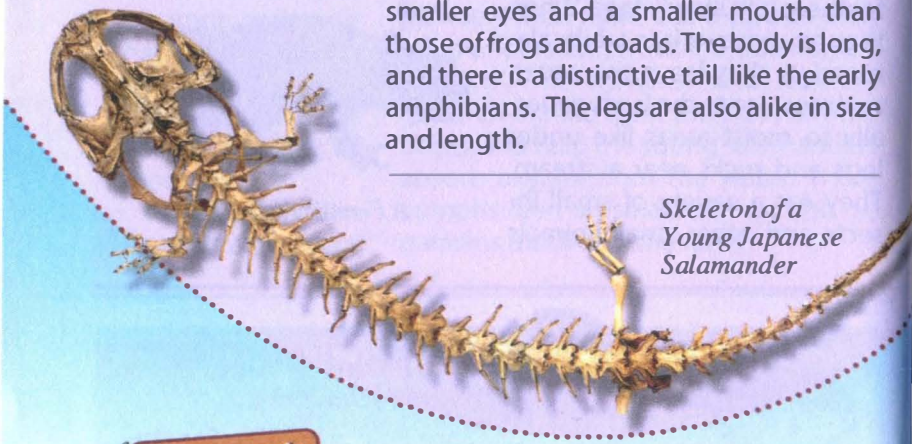


Great Siren Salamander

Why are modern day salamanders in many ways similar to their ancestors?

The salamander's ancestors appeared 350 million years ago when Earth consisted of one large landmass surrounded by a vast ocean. Some small fish evolved into creatures that developed legs in place of fins, allowing them to live on land and sea. These were the amphibians who lead double lives- on land, and in the water.

Today, salamanders and newts bear a stronger resemblance to the early amphibians than frogs or toads. Their body shape has not changed since ancient times, and the head remains narrow, with smaller eyes and a smaller mouth than those of frogs and toads. The body is long, and there is a distinctive tail like the early amphibians. The legs are also alike in size and length.



Skeleton of a Young Japanese Salamander

CURIOUS FACT

Breathing Underwater

When first hatched in the water, tiger salamander larvae are tiny, almost transparent and without legs. They have external gills that extend in long feathery plumes to take oxygen from the water. The gills are a deep red in colour because they are rich in blood vessels that absorb the dissolved air directly from the water.

Why is metamorphosis an important part of the salamander's life cycle?

Most newts and salamanders hatch from eggs. The larvae or babies look more like their parents than the larvae of frogs and toads. Generally speaking, the young live and grow in water, breathing through their gills. Gradually, through a process known as metamorphosis, the young ones develop legs and lungs that enable them to breathe on land too. When the legs are fully formed, the gills disappear. During metamorphosis, the skin becomes thicker, and the skeletal structure, eyelids, and tongue are formed.

It takes around two years for a salamander to reach adulthood. It now develops to male or female, and also develops its colours. By the time it reaches maturity, the salamander learns to use its colour to mimic its surroundings, and to use it as a camouflage to escape its enemies. The adult salamander returns to the water to lay its eggs, thus completing the cycle.



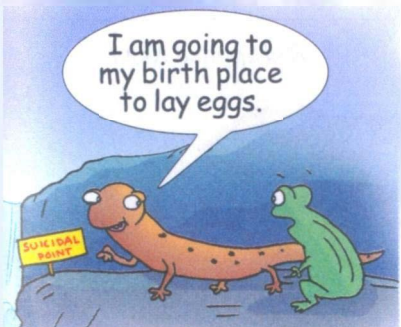
Metamorphosis Stage I



Metamorphosis Stage II



A Newt Larva



What are efts?

Newts lay individual eggs, each of which is wrapped carefully in a leaf of pond weed, by the female newt. Unlike tadpoles of frogs and toads, newt larvae develop their front legs before their back legs. They breathe through external feathery gills which sprout from behind the head. Juvenile newts leave the water in late summer after losing their gills and developing lungs. Some species also become more brightly coloured during this stage. Once fully metamorphosised they leave the water and live a terrestrial life, when they are known as 'efts'.

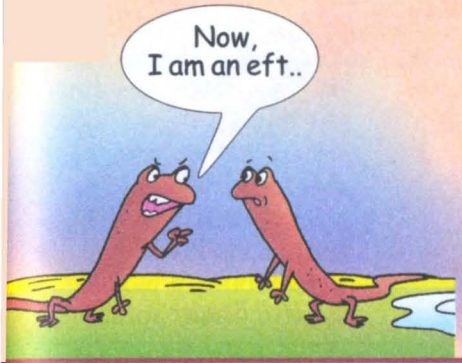
However, efts are not mature adults. Newts remain in this

What are the early stages of a newt's life?

Newts lay their eggs in water, and look after them carefully. The female takes care to wrap the egg in water weeds to protect them. The egg divides to produce a cluster of cells that forms an embryo with a head, tail, and the beginning of limbs. After about three weeks, the eggs hatch, and newt larvae emerge. The larvae breathe with feathery gills, and feed on water fleas and blood worms. By eight weeks, the body has lengthened, and the tail has grown longer. Gradually, the larvae take on an adult shape, and develop the limbs and lungs that will enable them to leave the water and live on land.

Red Spotted Newt





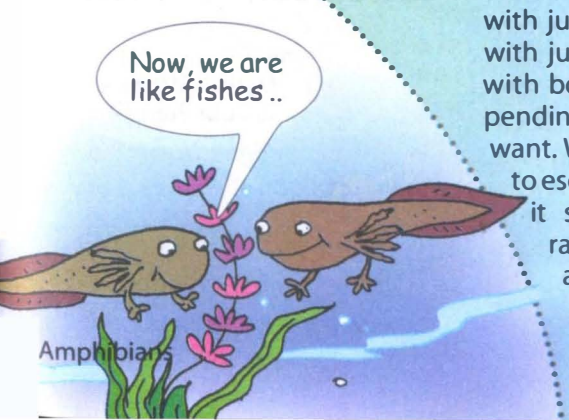
terrestrial eft stage for up to seven years, after which they undergo a second metamorphosis, and become adults. When they are fully adult, they may return to the water to breed. Some adult newts, however, become fully aquatic, and rarely return to land.



Red Spotted Newt Navigating over Leaves

Why do we say that newts move in different ways?

Newts move both in water and land. In the water, they swim using different types of leg, body and tail movements. When they want to float, they stretch out their legs and inflate their bodies slightly with air. While swimming lazily, they use their legs like oars. Newts swim faster by paddling either with just their front legs, or with just their hind legs- or with both pairs of legs, depending on the speed they want. When a newt is trying to escape from a predator, it swims very fast, by rapidly flexing its body, and lashing its tail from side to side.



STAR FACT

Poisonous Newt

The red eft is found in North America. Efts are the stage that newts go through when they move to the land, but are not yet fully adult. The red eft's bright red colour is a warning to its enemies that it is very poisonous indeed.

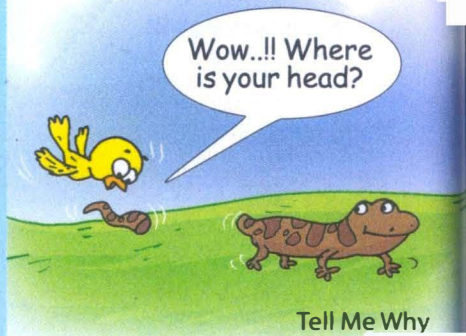
While on land, newts walk rather slowly. Their legs move in alternate and opposite patterns- for example, the left front foot will be moved forward at the same time as the right hind foot. The other two feet remain in the same position, ready to take the next step. When walking on the bottom of a pond, the newt uses just the tips of its fingers and toes. Do you know why? It's because a newt is much lighter in water than on land, and therefore, movement is easier.



Hell Bender

How do salamanders defend themselves?

Because salamanders can be an important food source for many reptiles, birds, and mammals, it is not surprising that they have defense mechanisms to help them avoid predators. The redback salamander may assume a coiled, defensive posture that protects its head. Most salamanders produce sticky, distasteful, or poisonous skin secretions that deter these predators.



The slimy salamander is well known for smearing attackers with a sticky secretion, and the large tail of the tiger salamander can flip harmful secretions onto a predator's face.

Salamanders can lose their tail if caught by a predator, and grow it back again later. Some



Red Back Salamander

species pretend to be dead when they spot a predator, while others try to frighten the enemy by displaying the bright red underside of their tails. Another species has needle like rib tips that can pass through the skin of its body, and give an enemy a nasty poke!

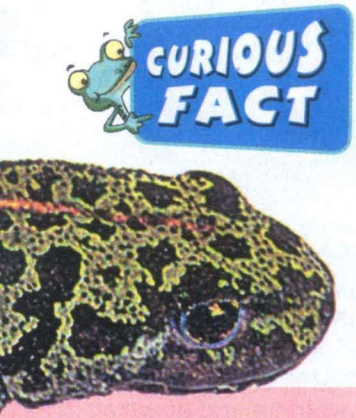


Fire Salamander

Why is the salamander's way of moving unusual?

Salamanders move both on water and land using an up and down action While they are swimming, the entire body moves in this way, and the tail gives the maximum push against the water to propel the animal forward. On land too, the salamander moves in a similar way. It finds it difficult to lift its body off the ground, as its limbs are spread sideways. So, it throws its body forward in a curve by first moving its right front foot and left rear foot forward together, while the other two feet provide the necessary push. It is a very slow way to move, though, and a lot of energy is wasted in the effort. Perhaps that is why the salamander prefers water to land!





Sight and Smell

Salamanders living on land need good eyesight to spot their prey, because, they live in dark places, and come out only at night. Some newts, called marbled newts, use both sight and smell to locate their food, especially in the water. Salamanders make no sounds and cannot hear, although they do feel vibrations in the ground with their forelegs and lower jaw.

Eye of a Marbled Newt

Why does the European salamander's walk look like a baby crawling?

The European salamander walks in a rather funny manner. It will first simultaneously lift a front foot along with the back foot on the opposite side. For example, it will lift the left front foot and the right rear foot together. The other two feet will remain on the ground to provide the necessary push forward. The next step will be taken by moving the right front foot and the left rear foot forward together, while the other two feet remain stationary. This action makes the middle of the salamander's body sway from side to side, so that from above, it looks like a baby crawling.

European Fire Salamander

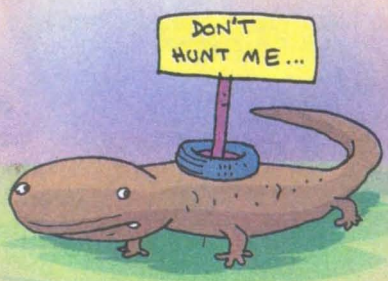


Chinese Giant Salamander

Why is the largest living amphibian threatened?

The largest amphibian in the world is the Chinese giant salamander. It reaches a maximum length of 1.8 metres. It lives in cool, fast-flowing streams and mountain lakes, and feeds predominantly on fish and crustaceans, or shell fish.

The Chinese salamander has a broad head and mouth, and is usually dark coloured with light colours underneath, and black patches on its upper side. Its four limbs are short, and its tail accounts for more than half of its length. It has a smooth and thick skin. The breeding season occurs between August and September, when 500 eggs are laid in a burrow guarded by the male. This salamander is threatened, as it is being hunted for food and for traditional medicines, even though it is a protected animal. Their numbers in the wild have decreased. Loss of habitats and water pollution are also factors contributing to its decline.





Taricha Newt

Why are Taricha newts and fire salamanders similar?

Taricha newts and fire salamanders can both be toxic to human beings. Newts are small, semi-aquatic amphibians, having a long slender body and tail, and short feeble legs. The taricha newts of western North America are particularly toxic. They produce more than enough of a poison that can kill an adult human, if it is swallowed.

Among the most colourful of the salamander family is the fire salamander, which is easily recognizable by its striking black and yellow markings. Fire salamanders have a rubbery skin through which they can exclude





AMAZING

Young tigers

The larvae of tiger salamanders are around 10 centimetres long when they hatch, and they develop into young adults around twelve weeks later. They will eat almost anything that will fit into their mouths- that is why they are so large!

a toxic alkaloid called samandarin. This poison is squirted at attackers from skin glands. If the poison gets in the eyes, it causes convulsions, and high blood pressure. So, be very careful when handling these two amphibians- or, to be on the safe side, avoid handling them altogether!



STAR FACT

Disappearing Newt

The great crested Newt is Britain's largest and most threatened newt. Twenty years ago, these newts were seen in abundance all over Europe. Today, they are a protected species, and so rare you need a license to even to examine one in the wild! The main reason for their declining numbers is the increased use of agricultural poisons, and the filling up of ponds.

● *Vivek Agarwal*





Larva of Great Crested Newt (Left), Great Crested Newt (Below)

Why are some species of newts so interesting?

Some species of newts are very interesting indeed. Fire bellied newts are found in China and Japan, while palmate newts of Western Europe are more aquatic than the common newts. The great crested newt is of course known for its crest, but did you know that the crest of a male Italian crested newt is even larger, and more distinctive?

The alpine newt is a very pretty one, but it is found in other regions besides the Alps, while the marbled newt from France Interbreeds with the great crested newt to produce a hybrid newt.



The rough skinned newt is known for its poison, while the Iberian ribbed newt is known for its sharp ribs which can puncture through its sides, to poke an enemy. To put it in a nutshell, newts come in all shapes and sizes - and all of them are interesting!

Chinese Fire Bellied Newt

Which are some of the interesting varieties of salamanders?

Have you ever heard of mandarin salamanders? They are sometimes called crocodile newts, and are found in India and Eastern Asia. They are famous for consuming large amounts of food. Then there are hellbenders that about sixty centimetres in length, and are among the largest salamanders in the world. They are great fathers, and it is the male who looks after the eggs until they hatch.

Tiger salamanders are usually brown in colour, with brilliant yellow stripes or blotches over the length of their bodies. They are the most wide-ranging salamander species in North America, and are one of few salamanders able to survive in the arid climate of the North America interior. There is a variety of lungless salamanders that are unusual, because they live on land, but have no lungs to breathe with. Instead, they breathe through their skins. The dwarf Mexican lung-less salamander is abiut 2.5 centimetres in length and is one of the smallest in the world.



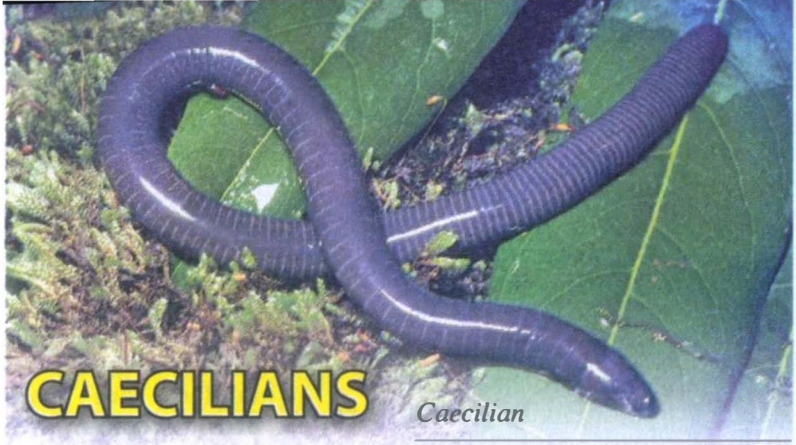


Italian Crested Salamander

Will it Survive?

Golden striped salamanders are dark brown in colour, with two parallel golden stripes on the back. They are found in moist deciduous forests, where bushes and mosses are plentiful. They prefer to live under stones near rocky streams and caves. However, such places are becoming rarer and rarer, with more and more land and water being used for agricultural purposes, so, they now face the threat of extinction.

Slender Lungless Salamander

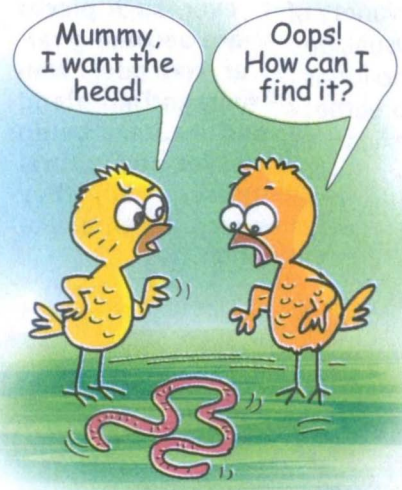


CAECILIANS

Caecilian

Why are caecilians mysterious?

Caecilians are amphibians that live underground. They look like worms or snakes, and are legless. They have a short tail, but sometimes, it is hard to tell which end is the head, and which end is the tail! Their shiny skin is ringed with skin folds called annuli, and they usually come in shades of gray, brown, black, orange, or yellow. Some species have tiny, fishlike scales within the rings.



Because of their underground lifestyle, caecilians have little need to see or hear. Therefore, their eyes are very tiny in some species, or hidden under the skin–which makes some people think that caecilians are blind. In fact they get their name from the Latin word 'caecus' which means blind. Actually, they are not blind, but their vision is poor.

Caecilians don't have ear openings, so it is doubtful if they can hear sounds the way we do. They rely on their sensitive tentacles, located between the nostrils and the eyes, to locate their prey, and find their way around. These tentacles help

Worm, Snake or Amphibian?

Caecilians are amphibians. The larger ones look more like snakes.

Their burrowing way of life has led to adaptations like the lack of limbs and small compact skull- and these adaptations are the reason for their misleading appearance.

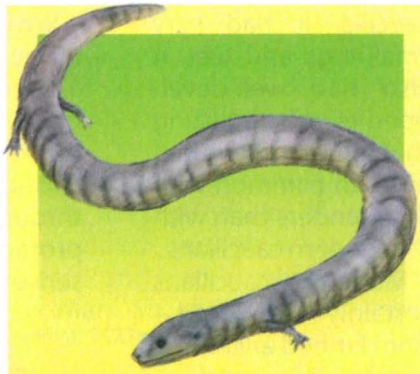
● *Chinmay Tiwari*



Asiatic Tailed Caecilian

the animal to detect chemicals dissolved in the air.

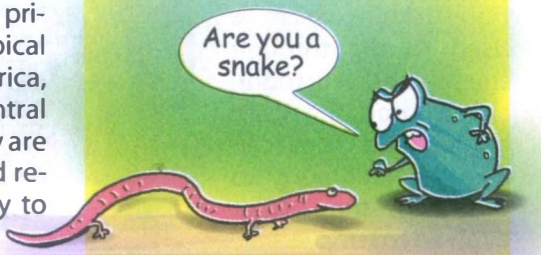
Caecilians are found primarily in the wet, tropical regions of South America, Southeast Asia, and Central America. However, they are rarely seen by Man, and remain a bit of a mystery to this day.



The Earliest Known Caecilian

How did Caecilians evolve?

The modern caecilians, with their limbless, superficially worm-like or snake-like bodies, are perhaps the most unusual amphibians in appearance, and their behaviour can be equally strange. The earliest caecilian is reported to be from the early Jurassic period in Arizona, U.S.A. 190 million years ago, and was named Eo-



caecilia. It had very small legs and feet. It also had well-developed eyes, suggesting that they may have had more in common with salamanders than with the modern caecilians.

Modern caecilians certainly evolved from limbed ancestors however, and therefore, underwent major changes in their evolutionary history as they developed elongated, externally-segmented bodies and much-reduced eyes, and lost their limbs, and, in the case of the most recently evolved species, their tails too. At the same time, they adapted their bodies for burrowing, with a bony skull which is used to dig through the soil, and very tough skin. In short, the weird appearance of caecilians is a testimony to the way they have evolved to survive.

Why are caecilians adapted to a burrowing lifestyle?

Caecilians spend most of their life below ground, and are adapted for a burrowing lifestyle. They have strong bony heads for digging through the soil, and their eyes are protected by skin. Caecilians have sensory tentacles on either side of

STAR FACT

Diet of Caecilians

Like all amphibians, caecilians are vertebrates, and have jaws and teeth. These enable caecilians to lead a carnivorous lifestyle, feeding on insects, worms and other small animals without backbones.

● *Arvind Bhat*



A Caecilian

their head to detect the chemical signals of its prey.

They have both jaws, and small sharp teeth. They have a double set of jaw muscles, whereas other vertebrates have only a single set. It is



Another Species of Caecilian

thought these are used to hold the mouth firmly closed when the animal is burrowing.

Most caecilians have lungs, but they also use the skin of the mouth to absorb oxygen. The skin is tough and unique among amphibians in that it has small scales. Generally, caecilians are small, but a few may get as long as a hundred centimetre.

Where are caecilians found?

There are over 155 known species of caecilian, but this number may not be entirely correct, because caecilians are one of the least known creatures on this Earth. They spend a lot of time underground- though a few live in water- and have rarely been seen by Man. So, there may be many more species of caecilians out there that have not been discovered yet. Caecilians are found in South East Asia, Africa, South America, South China, New Zealand, and Vietnam, but the aquatic caecilian is usually only found in South America. In fact, caecilians are most widespread throughout South America, where they inhabit Eastern Brazil, Northern Argentina, and Northern South America.



A Caecilian on a Rock



MORE ABOUT AMPHIBIANS

Why do we say that amphibians are good at defending themselves?

Amphibians have special ways to defend themselves- and they need to do so because they are not very strong, nor do they move very quickly. They do not have special

How do amphibians take care of their eggs?

Some amphibians don't take care of their eggs at all-but there are others who guard their eggs determinedly. The female Brazilian tree frog makes a mud nest for her eggs, while the Surinam toad hatches her eggs on her back. Strawberry poison dart frogs avoid laying their eggs in



weapons either, like claws or sharp teeth. So, how do they defend themselves against stronger, quicker predators?

Well to begin with their bodies are quite slippery, and since they are shy by nature, they are very clever at keeping still so as not to draw attention to themselves. During the day, they hide under rocks and logs, and they come out only at night. They are also clever at blending into the background as they are coloured in different shades of greys, greens, and browns. They are good at camouflaging themselves too, using spots and stripes. Some amphibians use warning signs and bright colours to frighten an enemy, while others bluff the enemy into thinking that they are bigger and more dangerous than they actually are, or even that they are dead!



Crested Forest Toad



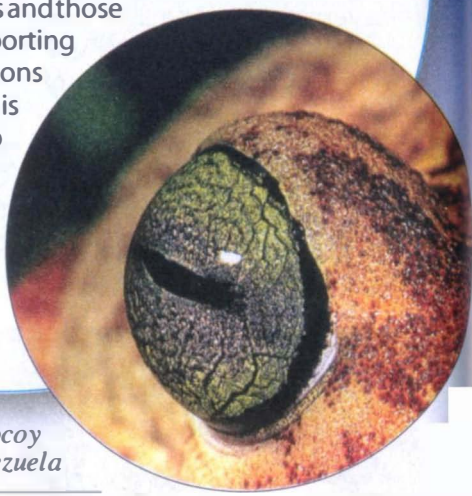
ponds and streams. Instead, the eggs develop on land until the tadpoles are ready to hatch. Then, the mother carries the tadpoles on her back to water-filled plants in the trees. The tadpoles complete their development in these tiny, predator-free pools, and the mother feeds them with unfertilized eggs.

Darwin's Frog

Why are frog's eyes so interesting?

A frog's eyes are interesting in that they have an inbuilt intelligence of their own. They let the frog see only what is useful for it! For example, a frog will see an insect that is flying towards it- but not an insect that is flying away. When a cloud drifts over the sun, the frog's eyes do not bother with this meaningless event. However, if a bird blocks the sun, this will be seen, and the frog will hastily plop into the nearest pond!

It is almost as though the frog's eyes have a very sensitive and selective computer in them- and scientists have been trying to duplicate this when building radars. You know that radars are used to spot aeroplanes. But they also confuse pilots and those manning them at airports by reporting clouds, birds, and even reflections from the ground. So, research is being carried out to develop radars that imitate frog's eyes. These radars will report only useful objects, and ignore those that are not relevant.



A Tree Frog from the Morrocoy National Park, Venezuela

The males of another species called Darwin's frog, brood their developing young in their vocal sacs until they metamorphose. Female gastric-brooding frogs brood the developing young in their stomachs! They do not feed at all through the developmental period, and can have over 20 young. Generally speaking, amphibians that take care of their young lay fewer eggs, while those that do not care for their young lay many eggs.



Female Painted Frog

Why, according to a mythological story, do frogs croak when they see a rainbow?

Have you heard this beautiful story about why frogs croak when they see a rainbow? Well, once upon a time, a frog was granted a boon by one of the Gods. Do you know what he asked for? 'Grant me the boon that my body will be made up of the seven basic colours of this world' demanded the frog.

This request made the God very unhappy. He knew that to gift all seven colours to one creature would be just asking for trouble. But he was bound to honour his promise to the frog. So the frog got his wish...and he looked very spectacular indeed with a coat of seven colours. Unfortunately, he also became very proud and quite insufferable-just as the God had foreseen. The frog's haughty ways made all the other animals furious, and they joined forces against the frog and mercilessly attacked him.

The frog fled once more to the God, and begged him for help. So the God took the seven colours from his body and threw them up into the sky, where they formed a rainbow. The frog was heartbroken at the loss of his splendour, and to console him, the God said 'Don't worry. You will still have control over the colours. When you see a rainbow, just croak as loudly as you can, and the rain will come and wash the rainbow away!' So that is why a rainbow can never be there permanently in the sky, and why you hear the frog go 'CROAK, CROAK, CROAK' whenever a rainbow appears!



Glass Frog Discovered in Colombia

Why is the number of species of amphibians constantly changing?

Amphibians are still a bit of a mystery to scientists. Just how many species of amphibians are there in the world? Current estimates of amphibian species are approximately 5,383. This number is constantly changing though, as new species are discovered, and some species become extinct. A search for frogs believed to be extinct has instead, led scientists to discover some new ones. A spiky orange rain frog, and three poison frogs are among 10 new species of amphibian discovered in Colombia. The creatures thought to be new to science also include three types of 'glass frog', which get their names from the fact that their skin is so thin that internal organs can show through it. A new harlequin frog, another species of rain frog, and a salamander have also all been found. Did you know that 129 to 221 new species of frogs have been identified in Madagascar alone?



STAR FACT

Tubercular Breasted Frog

The tubercular breasted frog is a medium sized frog. It is called by this name because it has a prominent white tubercle on either side of its breast, and another one level with its eye. Do you know what tubercles are? They are small rounded projections found on the surface of an animal or plant. This frog is found in India, Bangladesh, Burma, Thailand, China, Nepal, Myanmar; Indonesia and the Malay Peninsula, generally in mountain streams.

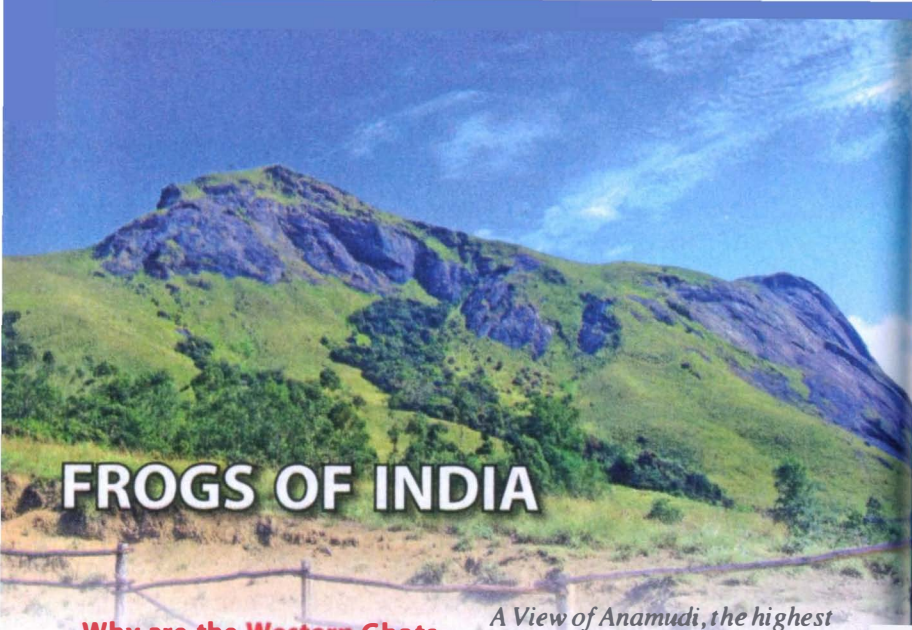
● *Ninu Dixit*

How long do amphibians live?

The life span of an amphibian depends on its species and on its environment. Amphibians in captivity have been known to live up to 20 years. The general life span probably ranges from 10 to 40 years. A common frog can live up to 8 years in the wild. A toad has lived 36 years, and a hellbender 29 years in captivity. Other species that live to a ripe old age include the giant toad that lives between 7 to 14 years, the green and black poison dart frog that can live between 7 and 17 years, the oriental fire bellied toad that lives between 11 and 14 years, and the ornate horned frog whose lifespan ranges between 5 and 12 years. Generally speaking though, it is difficult to pinpoint the life span of an amphibian because it is difficult to keep track of them in the wild.

Green and Black Poison Dart Frog





FROGS OF INDIA

A View of Anamudi, the highest Peak of Western Ghats

Why are the Western Ghats important especially as far as amphibians are concerned?

The Western Ghats, a 1,600 kilometre long mountain range, runs from north to south along the western edge of the Deccan Plateau. This range is home to a large number of animals that are not found anywhere else outside the Ghats. The region is also termed as one of the 'hottest biodiversity hotspots' in the world, and 179 different amphibian species can be found here.

A dozen frogs, new to science, were discovered in the forests of the Western Ghats recently. It was found that nine species belonged to the genus Raorchestes, and one to the genus Polypedates. The frogs were discovered in the hill ranges of Southern Western Ghats after several expeditions spanning the last few years. Six are bush frogs, one is a canopy bush frog and two species are associated with bamboo reeds.

Frogs all over the world are facing high risk of extinction due to climate change, pollution, and habitat destruction. The new discovery points to the hidden biodiversity, and wealth of the Western Ghats, and this calls for a high level research and conservation efforts in the region.

Why is the purple frog important?

Scientists have recently discovered a very strange breed of frog- the purple frog. It is very important because it is a "living fossil," whose great great grandparents lived during the time of the dinosaurs. The doughnut-shaped, purple frog was found in a 'biodiversity hotspot,' in the mountains of Southern India. It is bloated and purple and has very tiny eyes. Scientists have given it the name Nasikabatrachus sahyadrensis, from the Sanskrit word for nose, 'nasika'. Batrachus, means frog, and Sahyadri is the name of its mountain home. The frog's head appears too small for its body, and it looks more like a squat, grumpy blob than a living creature.



Purple Frog

This chubby, seven-centimetre-long, purple amphibian with a pointy snout was found hopping around in the Western Ghats. The discovery of this frog is especially important, because it tells us something about the early evolution of advanced frogs that we would not know otherwise.



STAR FACT

Beddome's Toad

This small toad is found under rotting logs in the dense forests of Kerala. It is brown with indistinct black spots and limbs marbled with carmine. Its skin is covered with sharp conical warts, and it too, is a rare toad about which very little information is available.



This rare photo shows a frog swallowing a snake's head in a desperate attempt to save its life. Both died after a struggle that lasted over seven hours

Why is the Samkos bush frog an unusual spectacle?

The Samkos bush frog is an extremely rare frog. It has green blood, and turquoise coloured bones! Its strange coloured bones and blood are caused by the pigment biliverdin, a waste product usually processed in the liver. In this species, biliverdin is passed back into the blood, giving it a green colour.

Samkos bush frogs are found in the jungles of Cambodia. They breed in temporary rain pools in evergreen forests that are at a height of around 152 metres above sea level. They are small frogs, with a smooth body and translucent skin through which the green biliverdin is visible, making them even better camouflaged. The biliverdin also gives them a very nasty taste, as predators who to dare to bite these unusual creatures quickly discover.

Samkos Bush Frog



Why is very little known about Malabar torrent toads?

The Malabar torrent toad is a small toad. It is black, with grayish spots on the head, and bright yellowish spots on the underside. It is found in the evergreen forests of the Western Ghats, in small rocky streams. The tadpoles are black in colour, and have sucker shaped mouth discs that are adapted for life in the rapid mountain streams. These toads are very rare indeed, and so very little is known about their life history.



Malabar Tree Toad

The Malabar tree toad is a small toad attaining a maximum length of 35 mm. It is coloured a brownish grey above. A white band is present from below the eye to the shoulder, and another on the flank. The underside is whitish, with some black spots. The dorsal surface of the body is tubercular, with the largest tubercles in two rows on the sides. This toad is generally found in higher altitudes at about 600 m. in the evergreen forest of Kerala. Occasionally, it occurs in moist deciduous as well as in moist semi-evergreen forests near streams.



Malabar Tree Toad

Why is Rao's pale brown toad a mystery?

Rao's pale brown toad is a very small toad indeed. It is just 27 mm from tip to tip. As its name suggests, it is pale brown in colour, with a network of dark lines. Its sides are lighter, and its underside is a dirty white colour. It has warts and tubercles on its body, and is a bit of a mystery, as there is no data available on its natural history.



Why is the Silent Valley torrent toad considered attractive?

The Silent Valley torrent toad is a beautifully coloured toad. It is brick red, with bright orange throat, chest, and belly. It has small tubercles on its head and flanks, and rough skin. It is not very agile, and can only hop for short distances. This toad is found in the Silent Valley in Kerala, and not much is known about it, because it is a rare species.



Silent Valley itself is a mysterious place, of dense virgin rainforest and deep gorges, that is the home of many rare and unusual plants and animals not found anywhere else in the world.

STAR FACT

Beautiful bush

Beautiful bush is a beautifully coloured frog, leaf green above. This is a small frog found in Kerala. It attains a length of 23 mm. as Normally, thin green line and two or three large green spots are observed above its forearms.



A Bush Frog



Gliding Frog

Why is the gliding frog so called?

The gliding frog is a medium-sized frog found in Nagaland. This frog can glide for a considerable distance by the flap of skin in the lateral sides of the body for which they are commonly known as 'gliding frogs'. The gliding frog is generally found on big boulders and rocks near swift flowing hill streams. This is an edible frog, attaining a length of 62 mm. The upper surface of the body of a gliding frog is slate-coloured, and it generally has a white belly. A number of minute black spots are present on the throat and chest. This is a nocturnal species.



Common Indian Toad

Why is the common Indian toad useful to us?

The common Indian toad belongs to the family of true toads, Bufonidae. Distinguishing characteristics of the family include lack of teeth, lots of warts, and a pair of parotoid glands behind the eyes that secrete toxins. These toads are common in drainage ditches in rural and urban areas throughout the Indian subcontinent, and in Southeast Asia. During the day, these toads hide at the base of tree trunks, under stones, and boulders. They often come out at night to feed on insects swarming under streetlamps.

The common Indian toad is a big toad- around 165 mm in length. It is brown or yellowish brown in colour, and its body has a lot of warts on the upper surface. Males in this species

Fourth Order!

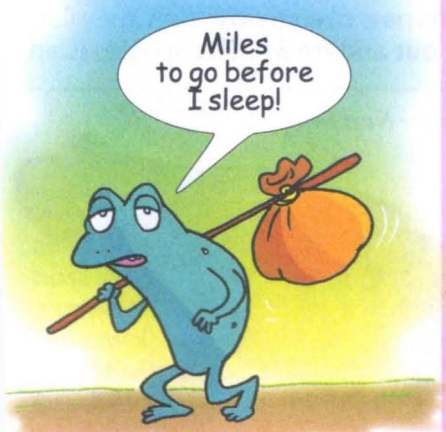
Amphibians are mainly of three orders. But some scientists identifies a fourth group too, which is known as Meantes (Tachystomata).

Some others, however, consider this as only a sub order of the third order Caudata, the group to which salamanders and newts belong.

are bright yellow in colour, and much smaller in size in comparison with females. These toads eat an assortment of invertebrates-beetles, crickets, grasshoppers and earthworms, to name a few. They are clever hunters, well aware of the precariousness of food supply, and hence, will rarely pass up the chance for a heavy meal. They are useful to us in that they eat a lot of the insects that we consider a nuisance!



A Tree Frog



Why is Boulenger's burrowing toad unusual?

As its name suggests, this toad is a burrowing toad. It comes out only at night, and burrows with great ease. It is a medium sized toad that is pale brown in colour, with darker spots from the middle of its throat to its belly. It is found throughout India, in Andhra Pradesh, Karnataka, Kerala, Orissa, and Tamil Nadu.

This toad is unusual, because, unlike other toads it does not eat black ants, beetles or earthworms. It eats only termites! It is also unusual in that it is more at home on land than in water. It walks and runs on land, and if it is thrown into water, it will jump back on land as quickly as possible!

MANORAMA

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Next issue

VOLCANOES

100 + FACTS ABOUT VOLCANOES

Why is the termite nest frog so special?

The termite nest frog is a moderately small-sized frog. It possess a total length of 45 mm, and the upper surface of its body is generally olive brown in colour, with dark markings. The life of the termite nest frog is very interesting. It is mostly found in termitaria, or under stones in association with large black scorpions. When disturbed, they crawl over the scorpions, but when the scorpions pass over them in turn, they flatten out and freeze. This species is an

Termite Nest Frog





Big Eyed Tree Frog

Blythe's Short Limbed Frog

This is a small frog that varies in colour from yellow to brown. Its belly and throat are yellowish, and have conspicuous black spots. In addition, its whole body is covered with warts of various sizes... it's not a very pretty frog!

excellent burrower in soft soil, and usually remains with the noseabove the ground. It is also a good climber, and can easily climb walls up to a considerable height. This frog is found in South India.

CLARIFICATIONS & CORRECTIONS

It is our policy to correct errors, and present differing views and clarifications about the contents in previous issues. Please send in your feedback, mentioning the title and page number.

Ms. Basanthi Mishra, a teacher from Kolkata, has sent us some add - on information for our July issue, Great Women.

She writes about Annie Besant, who started the Home Rule movement.

Annie Besant was an English woman who had Irish blood on her mother's side. She landed in India in 1893. The Theosophist headquarters at Adyar, Chennai is her brainchild. The Theosophical Society aimed at reviving ancient religions of India. She believed in the Swadeshi movement; in promoting local industries. Annie Besant outlined her plan for starting Home Rule League with the aim of getting complete Home Rule for India. She was arrested in 1917. Annie Besant fought the curses of untouchability and child marriage. Annie Besant died at the age of eighty six.

Thank you Ms. Basanthi Mishra, for your valuable feedback.

Editor

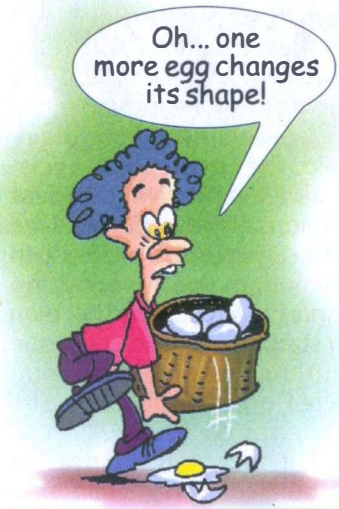
I Wonder Why? The question of the month

Aren't there many little things you have wondered about, but didn't know whom to ask? Send us your questions, and we will give you the fascinating reasons behind the incredible mysteries of life.



Why is an egg shaped the way it is?

Some say, eggs are egg-shaped because this shape adds to their strength. But if it were so simple, all eggs should have been of a spherical shape - yet pigeons and diving birds lay eggs that are pointy at both ends.



According to a mathematician named Dr. Tamas Szekely, the explanation for the egg-shape lies in the number of eggs a bird species lays. He found that eggs take a peculiar shape so that as many as possible can be packed together to get warmth from their mother, during incubation. For example, shorebirds like plovers typically lay approximately four eggs that are pointy-shaped. Because of their shape, the eggs can have a larger shape to occupy the space. On the other hand, ostriches lay just one egg, and a spherical shape is best for them. There are of course exceptions to this 'rule'. For example, the eggs of guillemots are pear-shaped. This may be because guillemots make their nests on cliff faces, and pear-shaped eggs don't roll in a straight line, and are less likely to roll over the edge.

● *Pankaj Mishra*